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# **Evaluating Bystander Intervention from a Victim Perspective Using Virtual Reality**

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## ABSTRACT

**Objectives:** This study examines the perceived effectiveness of bystander intervention in sexual harassment using virtual reality. **Methods:** A 2x3 factorial design compared two vignette presentation methods (VR vs. written scenarios) across three intervention conditions (direct, indirect, no intervention). The sample comprised 160 participants from a UK university. Outcome measures included self-report questionnaires capturing perception and emotion, alongside physiological sensing of electrodermal activity and heart rate. **Results:** Bystander action was noticed by victims, though type of action (direct or indirect) did not significantly influence immediate perceptions or emotions; both were reported as helpful. Direct intervention was more visible, but perceived as intrusive by some, while others found indirect intervention sufficient. Delivery method affected presence and therefore affective responses. **Conclusions:** Direct or indirect bystander intervention can be perceived as helpful. VR is a useful tool for assessing bystander intervention, but its novelty may amplify emotional responses, complicating the teasing apart of effects across different experiment conditions.

## Introduction

Most broadly, sexual harassment is defined as any unwelcome behaviour of a sexual nature that is intended to humiliate, degrade, intimidate or offend (Australian Human Rights Commission [AHRC], 2017). Sexual harassment in public spaces presents a pressing public health and safety concern (AHRC, 2017; Bondestam & Lundqvist, 2020). Although sexual harassment incidents are commonly witnessed by others, intervention remains uncommon (Burn, 2009; Labhardt et al., 2017). In response, policy initiatives increasingly promote bystander interventions through public messaging to increase bystander's confidence in recognising harassment and taking active steps to stop abuse and support victims. A large body of research has explored bystander intervention during incidents of sexual harassment across a range of contexts, including barriers and facilitators of intervention, along with the efficacy of bystander training programs (DeGue et al., 2014; Jouriles et al., 2018; Muij et al., 2019). Mostly, this research focuses on perspectives and actions of the bystanders themselves. The victim's perspective on these interventions, including whether victims perceive bystander action to be helpful, is underexplored.

The present study explores how victims experience and perceive direct (actively addresses the situation) and indirect (takes an action to disrupt the situation but does not address) bystander interventions. By doing so we answer questions about whether victims' experiences of harassment is made better, worse, or not affected by such interventions, and whether their perception of bystander intervention (or lack thereof) is positive, negative, or neutral. We consider how to measure these experiences and perceptions as well, making our contribution two-fold. On the one hand, we contribute to domain knowledge and discussion in the area of bystander interventions in public settings. Do victims perceive them as helpful? Do victims prefer one type of intervention over another (direct versus indirect)? On the other hand, we contribute to a methodological discussion happening around the use of virtual reality (VR) and immersive environments in experimental

studies. By deploying our scenarios in both written and VR modes, we explore how the method influences our outcome measures. We also measured presence and realism between the two formats. In the VR condition we measured indicators of physiological arousal (heart rate and galvanic skin response) to corroborate the self-report measure.

To record our outcome variables we use self-report and physiological measures to capture affect and arousal in response to the different conditions. Using physiology alongside self-report triangulates and addresses issues with recall and social desirability bias. We also collect qualitative data to analyse how victims perceive interventions to understand their experiences during such situations. By doing so we contribute to the understanding of how such interventions may differently influence victims' experiences of harassment, and what this might mean for the policy interventions which promote them.

Our findings confirm bystander intervention is generally perceived as helpful. Participants highlighted the importance of bystanders disrupting sexual harassment in both indirect and direct settings. These findings also suggest that the method of intervention is less important; both direct and indirect interventions were perceived as helpful. Ultimately, while intervention visibility matters, the method of intervention matters less than previously thought. We also find that deploying the scenarios in VR increases the sense of presence and emotional arousal in participants compared with written vignettes. While positive for increasing presence, methodologically, our findings suggest that the use of VR scenarios may amplify emotional intensity in ways that obscure more subtle psychological effects of particular interventions under study. This is important to keep in mind for users of experimental methods in criminology and beyond, as the same scenario deployed in different mediums may require different calibration and measurement approaches.

## Background and Rationale

Sexual harassment is a global public safety concern, reflected in international commitments such as the UN Sustainable Development Goal to "*eliminate all forms of violence against women and girls in public and private spheres*" (United Nations, 2026). Yet the full scale of the problem remains difficult to capture; definitions vary across jurisdictions and studies, and reporting rates are low which means official statistics represent only a small fraction of lived experiences. What is clear, however, is that sexual harassment produces substantial individual and societal harm. Victims experience physical and psychological consequences including injury, fear, and post-traumatic stress. Even non-victims may experience vicarious fear which leads to broader impacts on women's mobility and participation in public space (Lucas, 2012; Smith, 2008). Environmental criminology perspectives offer insight into how these harms unfold in everyday contexts. Sexual harassment arises when opportunity structures align. Routine activities bring together victims and perpetrators into places where crime opportunities can arise in the absence of capable guardianship (Brantingham & Brantingham 1984; Cohen & Felson 1979; Cornish & Clarke 1986; Felson 2008). These situational conditions influence whether harassment occurs, how it escalates, and whether bystander intervention is possible (Reynald, 2010). Understanding sexual harassment therefore requires attention not only

to individual motivations, but to the environmental cues, social dynamics, and *in situ* interactions that structure the opportunities for both harm and its interruption. University campuses are one setting where such opportunity structures converge (Klein & Martin, 2021). This makes them an important context in which to examine how sexual harassment manifests and how guardianship opportunities might disrupt it.

## **Sexual harassment in educational settings**

University campuses are a particularly common site of such harm (Klein & Martin, 2021). Prevalence estimates range from at least one in four (DeKeseredy & Schwartz, 1998; Koss et al., 1987; Muehlenhard et al., 2017) to 42% of all college students (Mellins et al., 2017). Large-scale U.S. research shows that 81% of women and 43% of men have experienced some form of sexual harassment (Kearl, 2018). In Australia, 26% of university students reported harassment in the past year (AHRC, 2017). While these estimates vary, it is clear that harassment in university has received social and political attention after the #metoo movement and increased scrutiny of Title IX management of sexual assault reports (Klein & Martin, 2021).

Sexual harassment encompasses a continuum of behaviours from unwanted physical contact to verbal or non-physical forms such as sexual comments, leering, staring, or unsolicited images (AHRC, 2017; Klein & Martin, 2021). These experiences carry physical and psychological consequences, including reduced institutional trust, depression, PTSD, and increased substance abuse and knock-on impact on victims' academic performance (Huerta et al., 2006; McGinley et al., 2016; Wolff et al., 2017). In response to these concerns, universities have turned to bystander intervention to tackle sexual harassment.

## **Bystander intervention**

Bystanders play an important role in crime prevention by fostering a sense of intolerance for harmful behaviour and taking action to stop it from occurring or continuing. Bystander intervention requires others to notice that something dangerous is happening, take responsibility for action, then intervene in a way that will provide help (Darley & Latane, 1968). As such, bystander intervention programs aim to increase recognition of harm while fostering a sense of responsibility to act to reduce incidents of violence (Robinson et al, 2022).

Not everyone who witnesses something concerning or dangerous does something about it. Bystander intervention reflects a complex judgement process (Barnum et al., 2024). In the AHRC (2017) report, only 80% of students who reported witnessing sexual harassment reported taking no action in response (AHRC, 2017). Research from psychology and criminology demonstrate that individual and situational factors influence bystander action. Darley and Latane's (1968, p.377) experiments showed how the presence of others in an emergency situation can cause a 'diffusion of responsibility' where everyone else thinks someone else will do something. Similar research has found that indecisiveness, perceived limited seriousness of the event, and a lack of skill or knowledge of what to do as key barriers to intervention (AHRC, 2017; Bennett et al., 2014; Kania & Cale, 2021). Some students worry they may make a situation worse, or report shock and confusion about witnessing such an event to have an incapacitating effect on bystander response (Robinson et al., 2022).

Prior victimisation and perceptions of crime, risks to personal safety, and physical competence all impact on a person's decision to directly intervene in a crime event (e.g., Moir et al., 2019; Reynald, 2010). Other work demonstrated gendered intervention patterns, while emphasising that preventing sexual violence requires collective responsibility (Baillie et al., 2022). Recent qualitative work with UK and Australian university students shows that ambiguity around consent and confusion about what constitutes a sexual assault are major barriers to recognising when intervention is needed, reinforcing the centrality of situational interpretation challenges in bystander decision-making (Labhardt et al., 2023).

To address some of these barriers to action, universities have developed bystander programs. Targeting behaviours such as bullying, sexual violence, domestic violence, and online victimisation (Robinson et al., 2022), these programs foster ideas that all individuals have a role to play in preventing and challenging social norms surrounding violence. They provide examples of direct and indirect bystander action and discuss why people choose not to intervene in potentially violent situations (e.g., Coker et al., 2016; Mazzerole et al., 2019). This equips students to identify potential risks for sexual violence and take safe bystander action (Coker et al., 2016). An early controlled evaluation of a bystander intervention found long-lasting improvements in students' readiness and ability to intervene in sexual violence situations (Banyard et al., 2007). More recent studies have similarly shown that university bystander programs enhance intervention willingness, and reduce rape myth acceptance and sexist attitudes (Hensman Kettrey & Marx, 2020; Mujal et al., 2021).

Studies examining bystander intervention suggest that while direct actions, such as confronting harassers or comforting victims, may signal support or help, they can also inadvertently make the situation worse (Hart & Miethe, 2008). Victims may respond more positively to informal, protective behaviours that quietly interrupt the harm, such as standing between the perpetrator and victim (Emery et al., 2017; McMahon, 2024; Moschella & Banyard, 2020). In contrast, more direct bystander action, such as physical and verbal threats towards the perpetrator may increase violence towards the victim (Emery & Wu, 2020; Fileborn, 2017; McMahon, 2024). Other studies have presented more mixed findings, suggesting that bystanders may sometimes unintentionally worsen outcomes as victims feel judged or pressured into behaving in certain ways post victimisation (Moschella & Banyard, 2021; Taylor et al., 2019).

Many programs encourage indirect intervening behaviours that do not require direct addressing of the harassment itself, which could be dangerous for the bystander. This can involve speaking to the victim or the perpetrator, or actions such as creating a distraction or moving in between the victim and harasser (AHRC, 2017; Fileborn, 2017). A systematic review of bystander intervention in intimate partner violence found common actions were challenging disrespectful language, removing victims from situations and offering support and referrals, as well as talking to perpetrators (Kusoff & Parsell, 2024). Bystanders taking indirect intervention (e.g. through distraction and offering the victim informal support) report more positive outcomes (Moschella & Banyard, 2020).

However, not much is known whether these interventions genuinely enhance victims' sense of safety or effectively deter harassment (Banyard, 2015; McMahon, 2024), leaving a gap in the research evidence (Kuskoff & Parsell, 2024).

## Experimental studies

One reason for the limited evidence on victims' experiences of bystander intervention is the lack of available data; sexual harassment is notoriously underreported (Fisher et al., 2003; Palermo et al., 2013; Spohn, 2020). Experimental approaches are a valuable avenue in such cases for testing the effects of interventions (Dezember et al., 2020). Experiments using scenario vignettes are widely used in criminological research to study a range of topics from police procedural justice (Nivette et al., 2024) to deterrence theory in prisons (Yasrebi-de Kom, 2025) to guardianship behaviour (Goudrian & Nieuwbeerta, 2007). Vignette scenarios offer controlled ways to examine how people interpret and respond to unfolding situations.

Traditionally delivered using written text, recent work has deployed vignette scenarios using virtual reality (VR) and 360 degree videos to increase realism and presence for participants, and enhance the validity of such experimental studies (Herman et al., 2025). Van Gelder et al. (2019) found VR scenarios elicit greater emotional engagement, realism, and physiological arousal compared to traditional written vignettes. Using immersive scenarios helps researchers observe real-time decisions and experiences during a crime event (Van Gelder et al., 2024; 2025). Labhardt et al. (2025) developed a highly naturalistic, immersive party environment to observe in-situ intervention decisions, directly addressing the ecological validity limitations associated with traditional vignette-based research.

## Measuring emotion

Another challenge to data collection comes from difficulties in measurement introduced by asking people to describe emotionally charged events. Self-reported measure of emotion can be limited by recall, social desirability, or lack of conscious awareness (Castro-Toledo et al., 2017; Solymosi et al., 2022). Emotional experience is often partly unconscious, and people may not fully recognise or report the physiological components of fear, stress, or discomfort. As a result, self-report alone can miss important aspects of the victim's experience, such as worry or other emotional reactions (Chataway et al., 2017).

Physiological indicators such as heart rate variability (HRV) and electrodermal activity (EDA) can provide complementary, real-time measures of emotional and stress responses (Bradley et al., 2001; Levenson, 2003; Martínez et al., 2017). Therefore, understanding victims' emotional reactions during harassment requires methods that capture both what people say they feel and what their bodies show they feel. Self-reported emotion is essential for capturing subjective meaning, but it is also vulnerable to the challenges cited above.

Physiological responses collected during VR scenarios have the potential to provide real-time, objective measures of participants' emotional states. Previous work has shown how these measures complement

subjective self-report measures when collecting data during video clip scenarios (Kim & Kang, 2018; Solymosi et al., 2022) but not yet with VR. Recent intervention work highlights the need for ecologically valid experimental tools (including serious games and immersive technologies) to measure real-time bystander responses, directly supporting the need for methodological innovation in this area (Labhardt et al., 2023).

## The current study

This study examines how victims perceive different types of bystander intervention in a scenario depicting sexual harassment (leering), specifically comparing direct, indirect, and no interventions in a university classroom setting. We compare whether these interventions influenced participants' interpretations of the scenario as sexual harassment, their perception of the intervention, and their physiological and self-reported emotional experiences. We investigate how the two measures of emotion relate to one another, and test whether presentation (VR or written) affects any outcomes.

As such, our contribution is twofold. First, we advance understanding of how victims perceive direct, indirect, and no bystander intervention. Second, methodologically, we test both how VR compares with written scenarios and how physiological measures compare with self-report, together offering a fuller contribution to experimental criminology's toolkit for studying victims' emotional responses.

To achieve this we examine three sets of questions. First, we test how victims respond to direct, indirect, and no bystander intervention, assessing differences in their interpretation of the staring as sexual harassment, their perception of the intervention, and their self-reported and physiological emotional responses. Second, we compare self-reported emotion with physiological arousal, asking whether stronger reported emotion corresponds with higher heart rate or EDA. Third, we contrast written and VR scenarios, evaluating differences in presence and realism and whether presentation format shapes any of the outcomes.

## Methods

### Design

We employ an experimental design with a 2x3 factorial design, comparing two presentation methods (VR vs written scenarios) across three types of intervention conditions (direct, indirect, control [no intervention]). The protocol was reviewed and approved by the Proportionate University Research Ethics Committee at the University of Manchester.

### Participants

160 participants (105 female, 53 male, 2 non-binary/third gender;  $M_{age} = 25.4$ ,  $SD = 7.5$ ) were recruited from university students (148 participants) and staff (12 participants), split between the VR (60 female, 18 male, 2 non-binary/third gender;  $M_{age} = 24$ ,  $SD = 4.6$ ) and written (42 females, 18 males;  $M_{age} = 26.7$ ,  $SD = 9.4$ ) scenario groups. Prior to invitation to attend, participants were screened for recent victimisation and

physiological compatibility; those who reported experiences of harassment within the last six months or any health conditions that would impact the physiological measurements were screened as unable to participate. Harassment was explained as behaviour that demeans, humiliates, and intimidates a person.

## Procedure

Participants attended the research laboratory, where those in the VR group were fitted with the ECG and EDA electrodes (Figure 1a & Figure 1b).



Figure 1a: Participant fitted with VR goggles, ECG and EDA electrodes and sensors.



Figure 1b: Close up of ECG and EDA electrode placement (not pictured ground electrode for ECG on collarbone)

iMotions software (Version 9.3.2, iMotions A/S 2022) was used to record the physiological measurements and to make a video recording of the participants. The 360 video of the scenario was deployed using Oculus Quest 2 Head-Mounted Display (Meta, 2022). Participants first watched a baseline video while their psychophysiological measurements were recorded. After, participants watched one of the three scenario videos, and after that completed the questionnaire and interview. Participants in the written group were not equipped with electrodes. These participants were provided with printed copies of the written scenario and completed the questionnaire and interview after reading.

In both groups, the study presented participants with one of three distinct scenarios to assess perceptions of direct, indirect, or no bystander intervention. All scenarios depicted a university classroom setting, where another student persistently stares at the participant, intended to cause discomfort (leering). In the control scenario, no intervention occurs, and the uncomfortable staring continues. The direct intervention scenario involves another student actively addressing the participant by tapping their shoulder, asking if they are alright. The perpetrator turns away and stops staring. The indirect intervention scenario portrays a bystander quietly moving seats to physically position themselves between the staring student and the participant. The perpetrator turns away and stops staring (see Supplementary Material for full materials for both VR and written groups).

## Measures

### Self-Report Questionnaires

A structured questionnaire was used to assess (i) harassment perception, (ii) bystander intervention effectiveness, (iii) emotional responses, and (iv) perceived realism and presence.

Harassment perception was measured using one 5-point Likert scale item asking participants if they viewed the scenario as sexual harassment (1 = “definitely not sexual harassment”, 5 = “definitely was sexual harassment”) and three open-ended qualitative questions exploring what the participant thought the scenario was about, how it made them feel, and a follow-up question to explain their reasoning.

Bystander intervention effectiveness was measured with three items: a 3-point scale asking whether any bystander noticed (“yes”, “no”, “not sure”); a 4-point scale assessing the perceived impact (“helped”, “made things worse”, “both”, “neither”); and an open-ended question asking participants to explain their answers.

Self-reported emotion was measured with the PANAS (Watson et al., 1988), two 10-item positive and negative affect scales rated on a 5-point Likert scale (“not at all” to “extremely”), followed by an open-ended question asking participants to explain their responses.

Perceived realism and presence were measured using 6 and 13 items respectively, adapted from van Gelder et al. (2019), rating how understandable, convincing, emotionally engaging, and immersive the scenarios felt on a 5-point Likert scale (“strongly disagree” to “strongly agree”) (see supplementary material for full questionnaire).

### Physiology

Physiological data were collected only in the VR condition using the Biopac MP160 system with BioNomadix ECG and EDA amplifier modules. ECG and EDA were recorded simultaneously. Participants were asked to limit their motion, and iMotions software was used to annotate artefacts.

For the ECG, we used a standard second lead (Einthoven configuration) with pre-gelled disposable electrodes. We used Kubios HRV Scientific (Version 4.1.1; Tarvainen et al., 2014) and R, controlling for potential artifacts and errors. Heart rate variability was measured using HF(log), which refers to the logarithm of High-Frequency power in HRV (HRV frequency band 0.15-0.4Hz; Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). The HF(log) shows natural logarithm transformed values of the absolute power of the HF band. This band is linked to the activity of the parasympathetic nervous system, which is sensitive to quick changes. Lower HF power is correlated with stress, panic, anxiety, or worry (Kim et al., 2018). We used baseline and the experiment measures of HF(log) to calculate a difference to provide an indication of the change in heart rate that the scenario elicits for each

individual while accounting for between person variability in heart rate levels. Four participants were excluded due to technical errors in the data collection.

For EDA, we attached electrodes to the distal joint of the middle and index fingers of the right hand. Dry electrodes and isotonic recording electrode gel, an electrode paste with 0.5% saline added to a neutral base to create an isotonic, 0.05 molar NaCl, electrode paste, acting as the conductor were used. The measured autonomic arousal through skin conductance provided objective data on emotional intensity and anxiety. Analysis was performed using AcqKnowledge (Version 5.0.1; Biopac Systems Inc.) and R, controlling for potential artifacts and errors. No skin conductance responses were observed within the data based upon the parameters established by Dawson et al. (2000), analysed using the Electrodermal Activity analysis package within AcqKnowledge. Due to environmental issues interfering with EDA measurement granularity, sophisticated analysis of skin conductance responses was not possible. Instead, we use the global averages in microsiemens. Computing the mean of EDA values in this way is one approach to assess arousal (Posada-Quintero & Chon, 2020). Two participants were excluded due to technical errors in data collection.

## **Results**

### **Reactions to Direct vs. Indirect Bystander interventions**

#### **Interpretation of Staring as Sexual Harassment**

In the control group, 13% of participants identified the scenario as harassment while 62% said it was not (25% were not sure). With intervention, recognition roughly doubled: 25% of the indirect intervention group and 26% of the direct intervention group classified the scenario as sexual harassment. Rejection of the label fell accordingly, to 45% in the indirect group and 37% in the direct group. Figure 2 shows how participants classified the scenario (Yes, No, or Not sure whether it was sexual harassment) across the three experimental conditions.

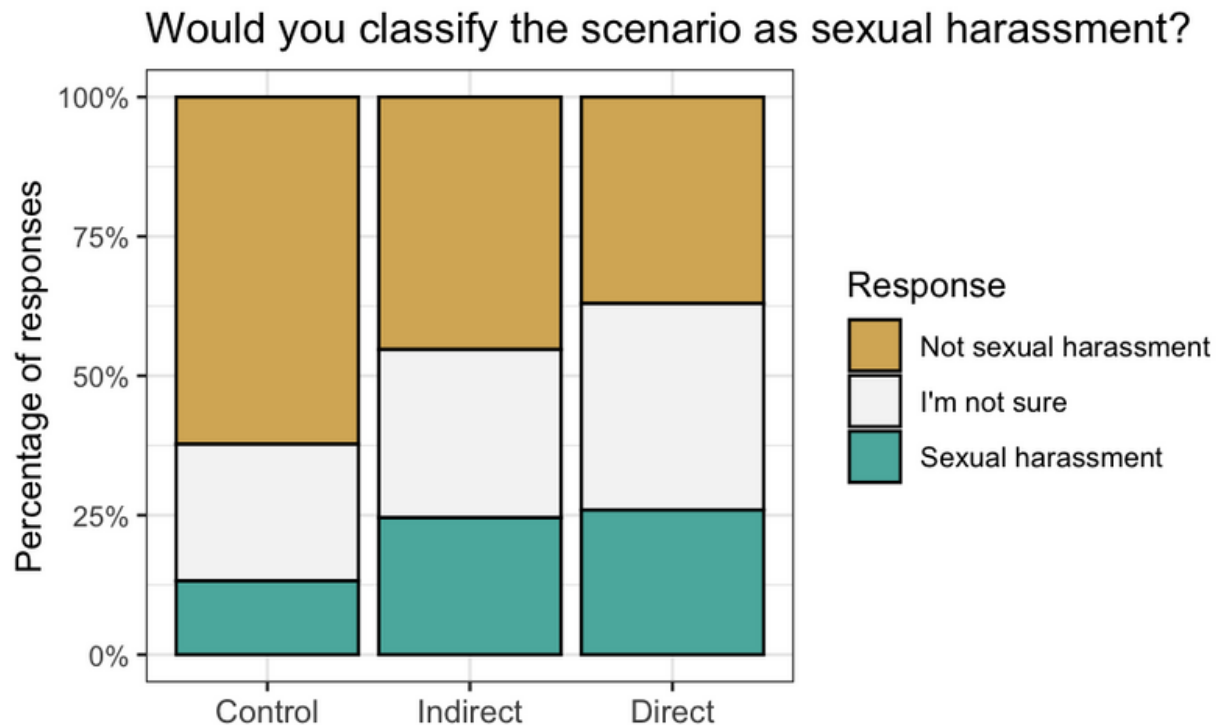


Figure 2: Proportion of participants classifying the scenario as sexual harassment across different scenarios.

However, this result was not statistically significant ( $\chi^2(4) = 7.48, p = .113$ ). This may be due to the low numbers in any group recognising the scenario as sexual harassment at all. Qualitative data from participants supports this assumption. Participants' comments suggest the act of staring was possibly too mild or too ambiguous to be considered sexual harassment. For example, P017 (female, student, VR scenario) highlighted the perceived mildness of the act as just staring, "...he just stares, and people stare all the time. If you ignore, then it's probably not [harassment]". P046 (female, student, VR scenario) spoke about the overtness of the behaviour being an indicator of whether the act was harassment or not, "he [is] staring at me on purpose, but he didn't do anything else to/or overt behaviour to me". Participants mentioned the setting to feel safe; P040 (female, student, VR): "If it was in a different environment, like a dark alley, it would be more scary; in a classroom full of people, it's not as scary.". The overarching theme from the qualitative comments was that sexual harassment is a loaded topic that people are weary to apply to such low-intensity situations:

"Sexual harassment is a big term and by including this thing not so trivial thing diminishes its importance. This doesn't mean it's okay to keep staring at someone but I would not regard this as sexual harassment." (G2\_P06; male; staff; written)

One participant mentioned the possibility of other types of harassment (i.e., racism):

*"It's not necessarily sexual, although it does make me feel uncomfortable. Due to my race, would think it is racial. Do not think his look is very aggressive, could be checking about other things." (P030; female; student; VR)*

## Interpretation of the Intervention

In both direct and indirect intervention conditions, participants reported someone noticing the incident. In the control condition, where no intervention took place, they did not (Figure 3). This difference was statistically significant ( $\chi^2(4) = 96.63, p < .001$ ) and supports the external validity of the scenarios, as bystander awareness was reported only in scenarios where it was actually present.

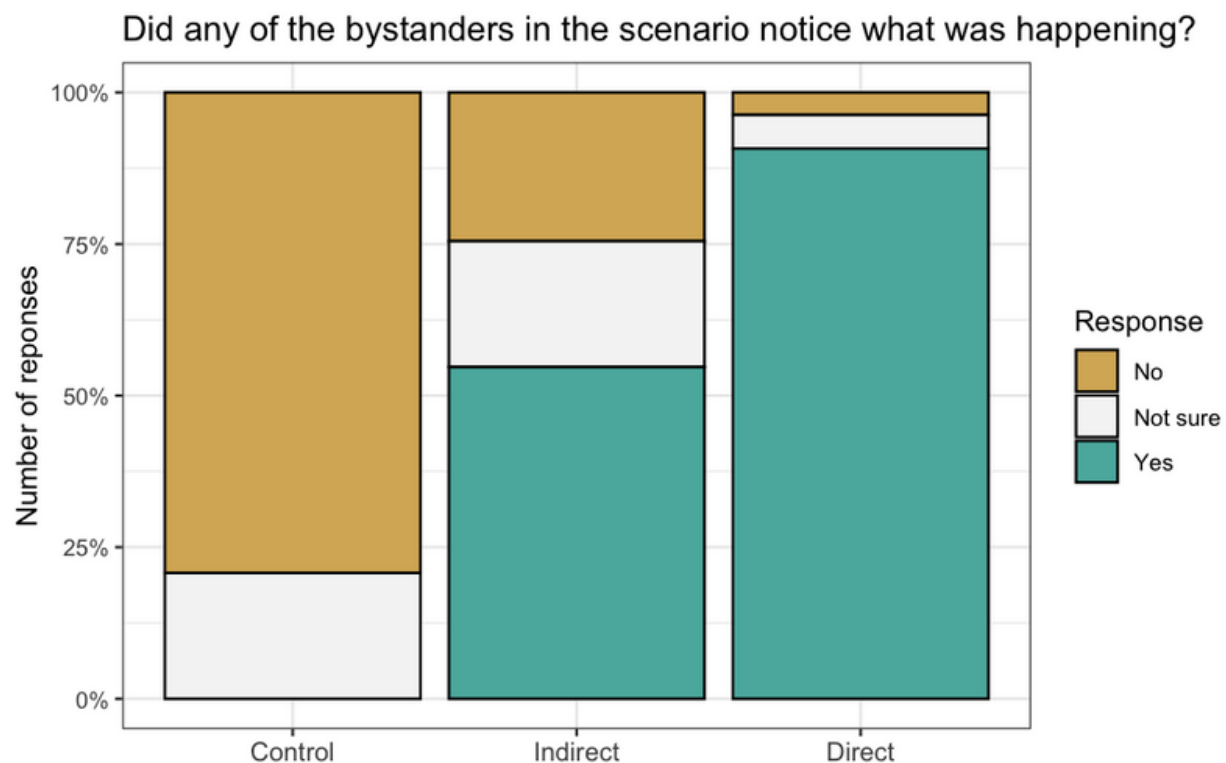


Figure 3: Proportion of participants reporting whether bystanders noticed what was happening, across different scenarios.

In the indirect intervention condition, 25% of participants said no one noticed the incident and 20% were unsure. In the direct intervention condition, these figures dropped to 4% and 6%, respectively. This difference was statistically significant ( $\chi^2(2) = 17.76, p < .001$ ) and reflects the nature of the interventions: indirect action was easier to miss, while direct intervention made bystander involvement clear.

Considering whether the intervention was helpful, Figure 4 shows most participants (81% in the direct intervention and 72% in the indirect intervention group) considered the interventions helpful. Comparing only

the two intervention styles, this is a significant difference  $\chi^2(2) = 80.35, p < .001$ .

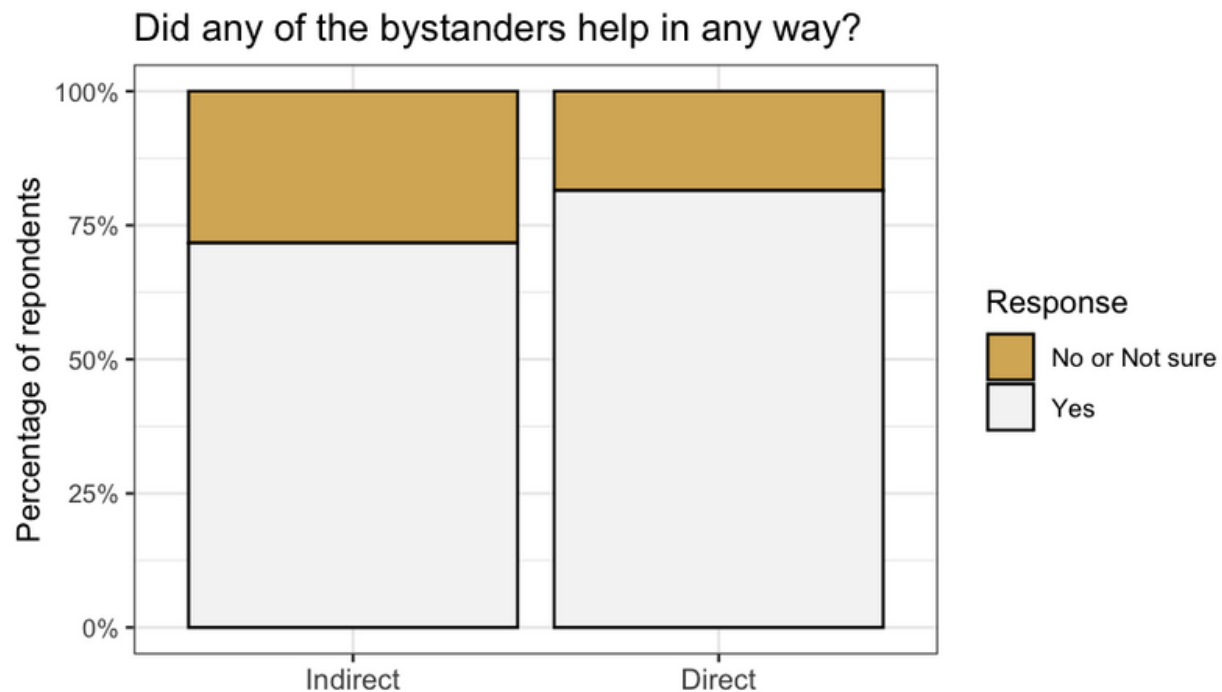


Figure 4: Percentage of respondents who said the bystander helped them in the indirect and direct intervention categories.

Even though there is a quantitative difference showing more participants rated direct intervention as helpful than indirect intervention, in our qualitative analysis neither type of intervention seemed to be perceived as more helpful than the other. Participants expressed ambivalent or negative reactions to both direct and indirect interventions. For instance, indirect interventions sometimes led victims to doubt the severity of their experience, exacerbating feelings of isolation.

*“Upon the student moving to block the line of sight and act normal, I would begin questioning myself and debate in my head the severity of the staring. The disregard from the remainder of the students would make me second guess my own thought process.” G2\_P62; male; student; written*

On the other hand, direct interventions, although overtly supportive, were occasionally viewed as intrusive, inappropriate, or insufficiently subtle, potentially heightening discomfort or perceived vulnerability.

*“I reckon the student who taps me on the shoulder is the bystander. However, I guess it is more appropriate for this student to not tap me on the shoulder. He can just speak to me and ask if I need some help. ” G3\_P59; female; student; written*

*"The bystander came over to me and ask if I was ok but I did not ask for help and he has made an assumption that there is a problem. Why didn't he go and sit next to the male student and ask if they were ok? As per my previous answer, I had no evidence to suggest I was being harassed. If anything the bystander has touched me on the shoulder and also sat next to me. Was that really necessary?" G3\_P32; female; student; written*

One participant reported experiencing a feeling of shame from the direct intervention:

*"The bystander pointed to the staring student directly which I thought may have drawn attention to the fact that he was bothering me. This made me feel a little weak. I would have preferred it had the bystander asked without making it obvious to the staring student." G3\_P02; male; student; written*

Participants also highlighted frustration when observing bystander inaction in the other people in the classroom, which compounded feelings of distress even when another bystander intervened effectively.

*"In a classroom of ten, someone will notice for sure. People who did nothing made it worse as they made it easier for the person who is staring. The only person who came at the end of scenario was helpful." G3\_P51; female; student; written*

*"In the moment I dont recall if someone else saw the scenario too because I had a quick glance around the room. How it helped was me knowing that someone else noticed it to and maybe if things went south, I'd have someone for assistance and worse by knowing that the other person has also seen this but aint doing anything about it and what if they are in this together." G1\_P57; male; student' written*

## Emotions

Besides evaluations of the experience we also asked people to rate the intensity with which they felt the emotions on the PANAS scale to measure positive and negative emotions experienced. Figures 5a and b show no difference between the three groups, confirmed by Table 1 which shows that neither model outperforms a null model and scenarios do not explain variation in either positive or negative self-reported emotion score of participants.

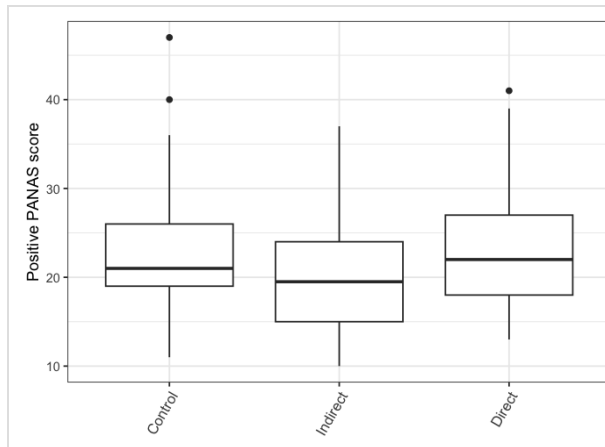


Figure 5a Positive PANAS score variation between scenarios

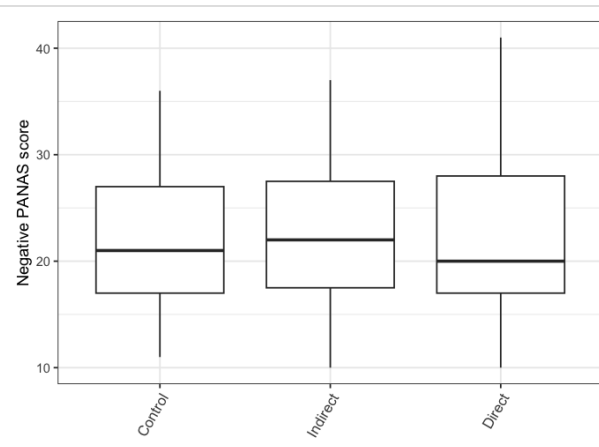


Figure 5b Negative PANAS score variation between scenarios

Table 1: Model results for PANAS score between scenarios

|                                                     | Model 1: Positive score |            |         |         | Model 2: Negative score                              |            |         |         |
|-----------------------------------------------------|-------------------------|------------|---------|---------|------------------------------------------------------|------------|---------|---------|
|                                                     | Estimate                | Std. error | t-value | p-value | Estimate                                             | Std. error | t-value | p-value |
| Indirect                                            | -2.2424                 | 1.3466     | -1.665  | 0.0979  | 0.4780                                               | 1.4219     | 0.336   | 0.737   |
| Direct                                              | 0.4151                  | 1.3402     | 0.310   | 0.7572  | -0.3233                                              | 1.4149     | -0.228  | 0.820   |
| Adjusted R-squared: 0.01564                         |                         |            |         |         | Adjusted R-squared: -0.01097                         |            |         |         |
| F-statistic: 2.248 on 2 and 155 DF, p-value: 0.1091 |                         |            |         |         | F-statistic: 0.1591 on 2 and 153 DF, p-value: 0.8531 |            |         |         |

Regarding heart rate variability, a one-way ANOVA across scenario conditions demonstrated a difference in HF(log) between baseline and experiment ( $F(2, 73) = 3.76, p = .03$ ; Figure 6). Tukey's HSD indicated the mean difference in HF(log) between baseline and experiment for direct intervention scenario ( $M = 6.04, SD = .7$ ) was significantly different from the control group ( $M = 6.01, SD = 1.05$ ) at  $p = .02$ . This indicates those in the direct intervention scenario experienced a generalisably smaller change in heart rate than those in the control group, although the effect size is small.

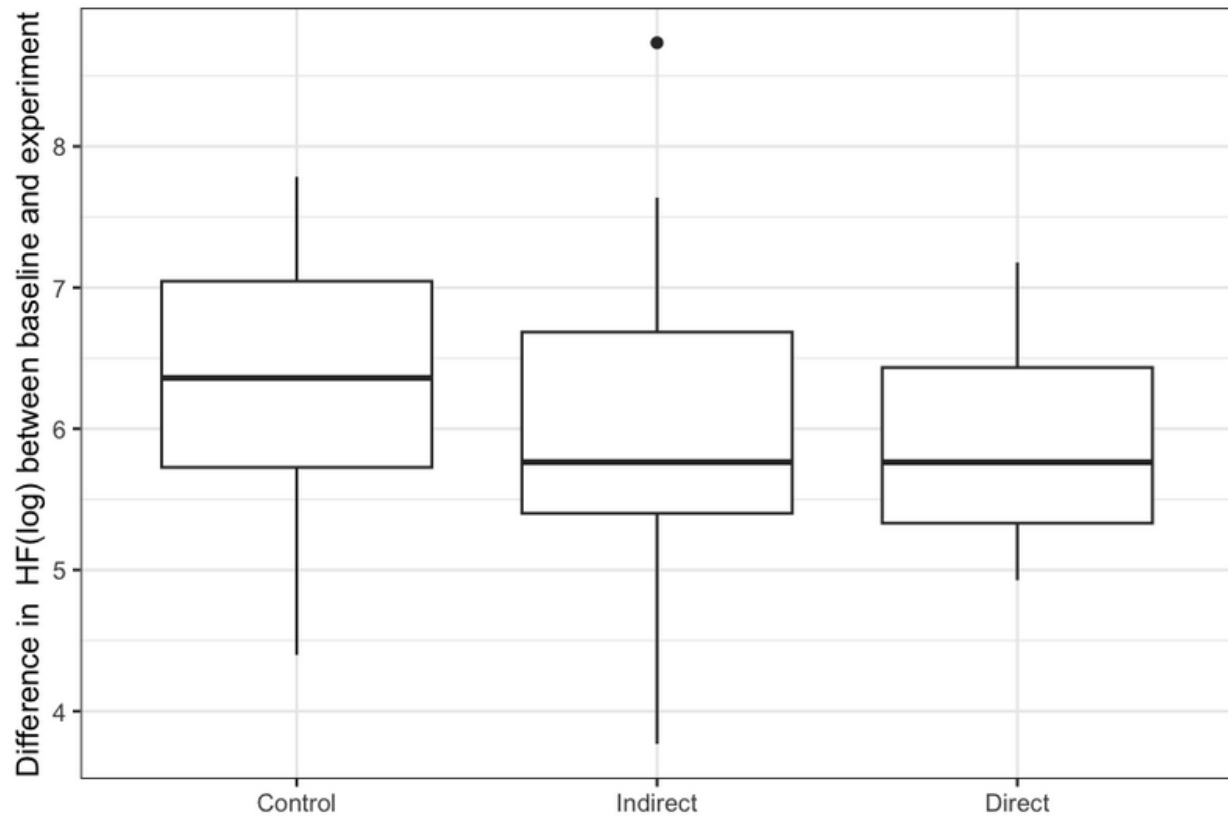


Figure 6: Differences in heart rate variability between scenarios.

Considering the mean differences in EDA measured in microsiemens, we see no difference between baseline and experiment conditions ( $t(153) = -0.093, p = .93$ ; Figure 7) or between scenarios (one-way ANOVA across scenario conditions:  $F(2, 75) = 0.07, p = .93$ ). The difference between mean EDA measured in microsiemens ( $\mu S$ ) in the baseline and experiment measures is no different between scenarios, indicating that we did not find higher physiological arousal in control, indirect, or direct intervention scenarios.

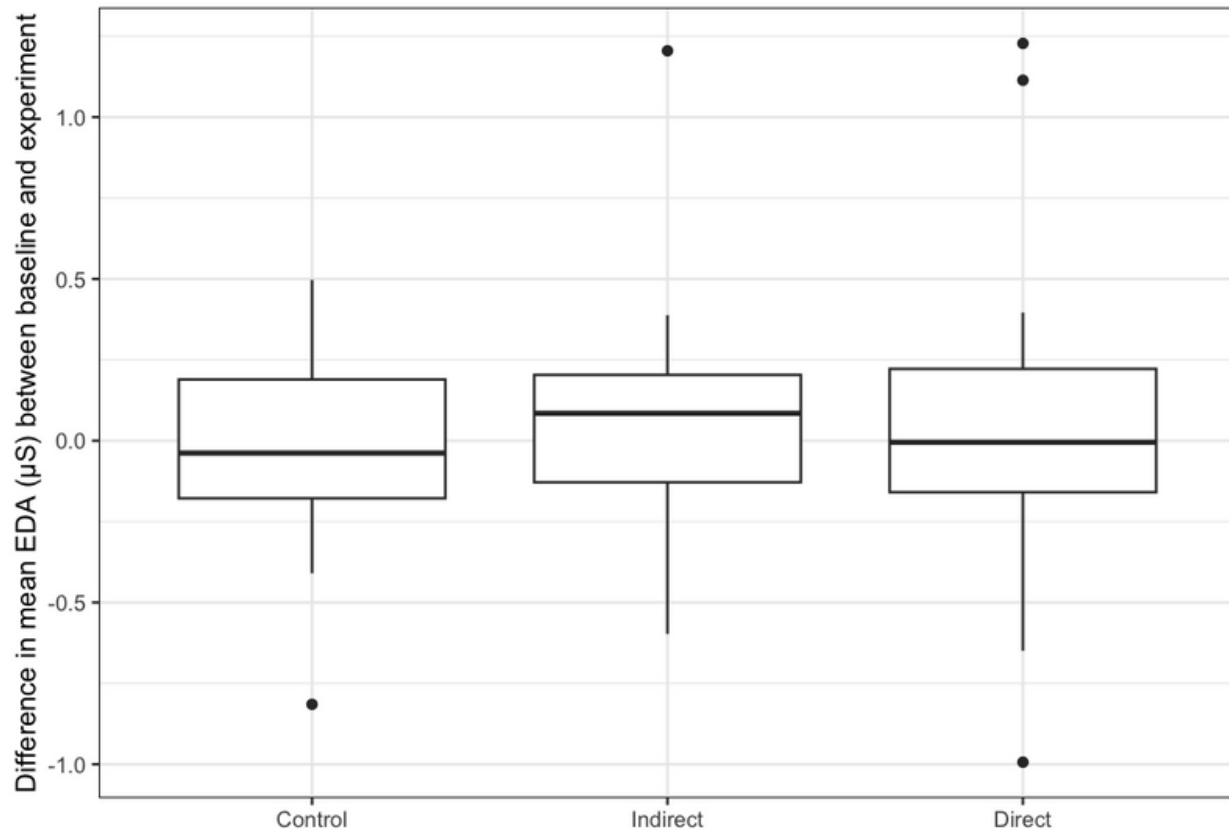


Figure 7: Differences in mean EDA between scenarios.

## Measuring emotions

Another thing we want to know is whether physiological and self-reported measures of emotions are tapping into the same constructs. First, we correlate the two physiological measures, finding a statistically significant, although small, positive relationship between heart rate and skin conductance levels in the experiment ( $r(74) = 0.28$ ,  $p = .013$ ; Figure 8). This correlation provides some validity that these measures are both capturing similar physiological arousal in participants. However, the small coefficient indicates there is variation in what is captured with each measure.

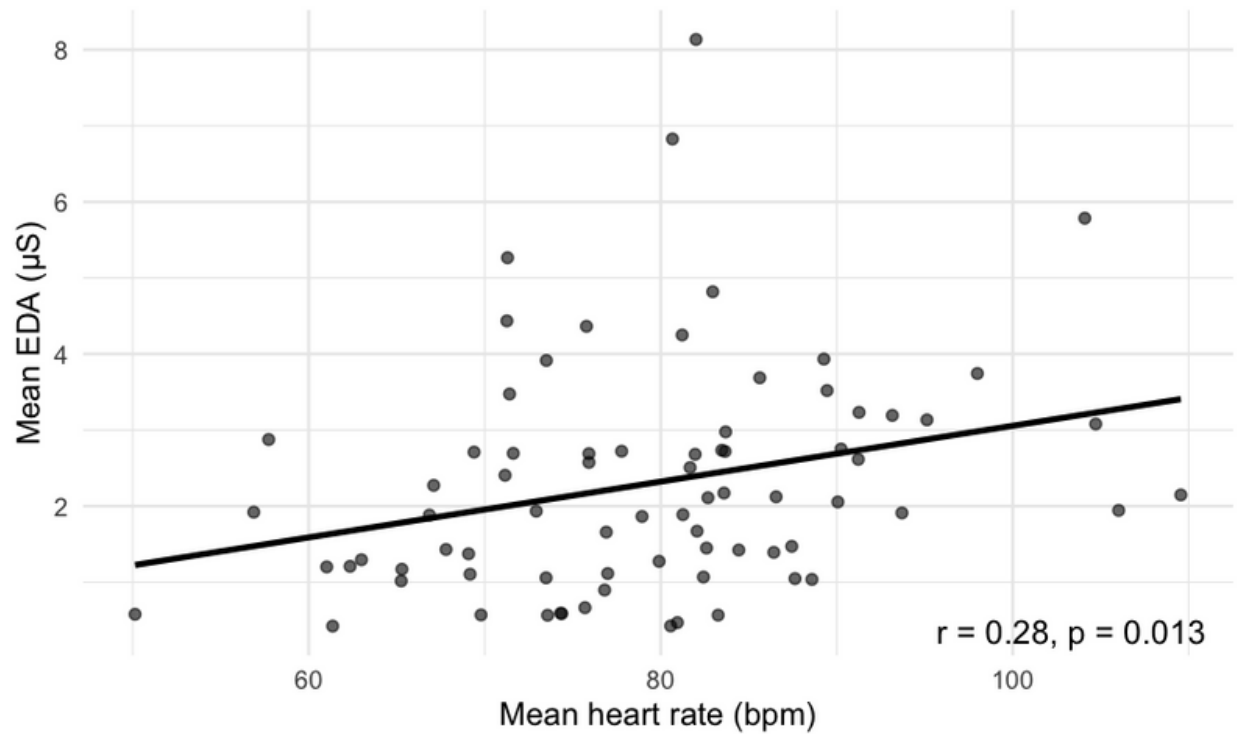


Figure 8: Correlation between heart rate and EDA measures of physiological arousal in participants

Conversely, we find no significant correlation between the self-reported positive and negative emotions and the (independent) physiological measures (Figure 9). This suggests self-report and physiological measures are not necessarily coherent as emotional processing is primarily subconscious and may not be reported when providing post-exposure feedback (Beck & Egger, 2018; Bolinski et al., 2021; Li et al., 2018).

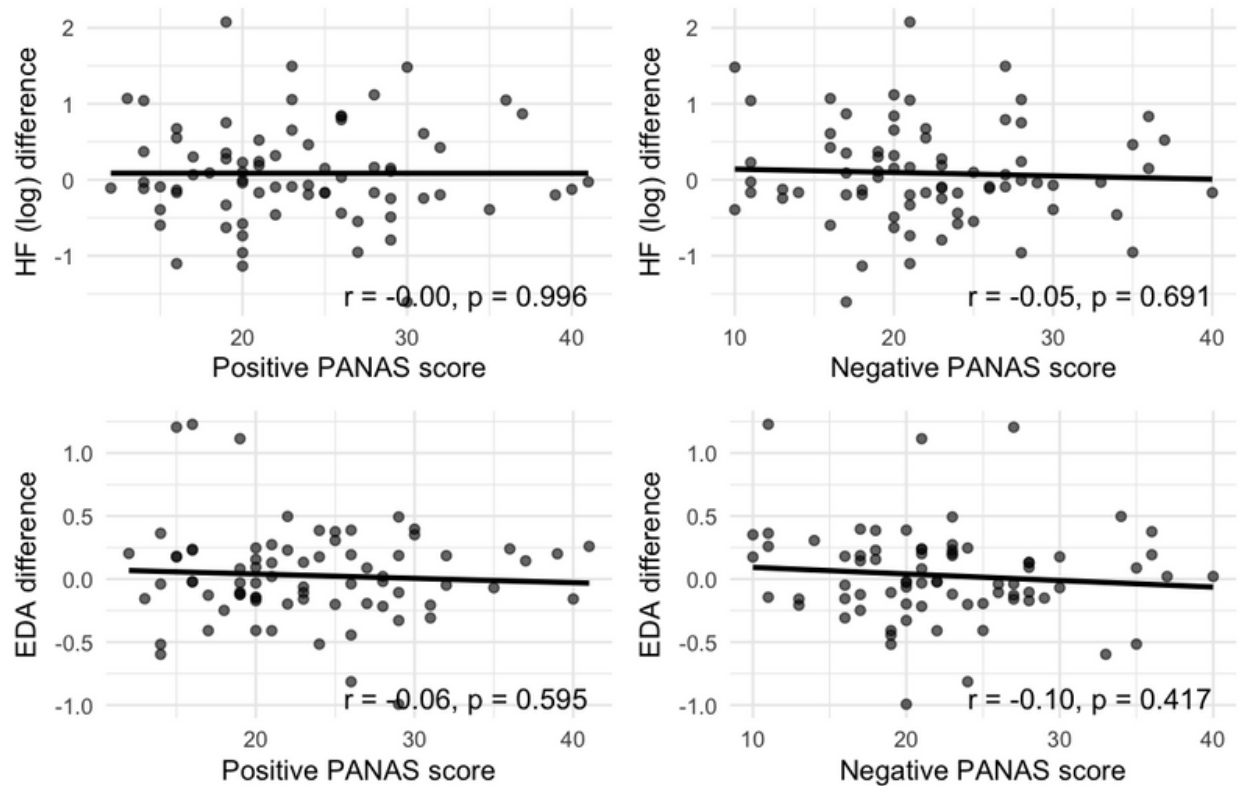
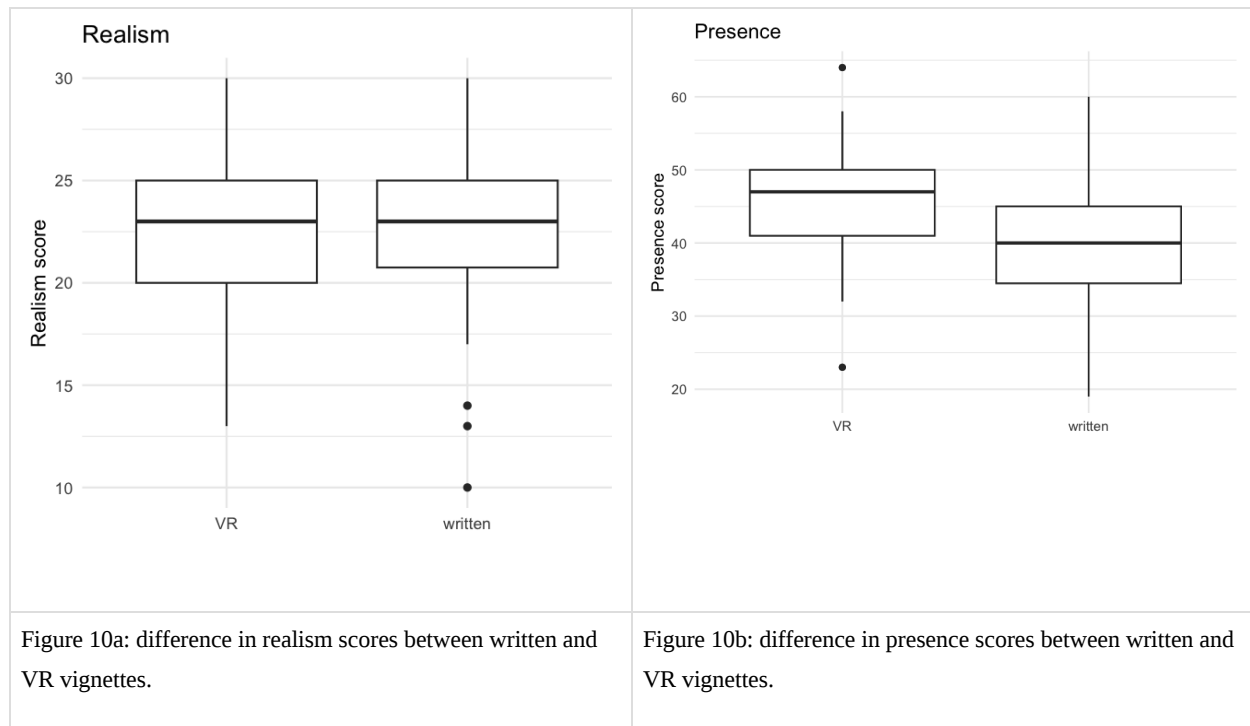


Figure 9: correlation between PANAS and physiological measures of emotions

## Realism and Presence between Written vs. VR Scenarios

Comparing VR and written scenarios we found no difference in realism ( $t = -0.57321$ ,  $df = 158$ ,  $p\text{-value} = 0.5673$ ) but did so in presence (estimate with 95% confidence interval= 3.351059 - 8.445460,  $t = 4.5737$ ,  $df = 157$ ,  $p\text{-value} = 0.000009667$ ) indicating higher presence scores for VR conditions (Figure 10a and 10b).



Van Gelder et al. (2019) also found a difference in presence in favour of VR scenarios over written, and no difference in realism.

Presence and realism might also affect the intensity to which people feel positive or negative emotions. We find this to be the case for the PANAS measures of self-reported emotions. For negative PANAS score, our results match Van Gelder et al. (2019); we found that greater presence is associated with greater self-reported negative emotions. However, while they find no effect for positive emotion, we find that in our model, including presence, realism, and whether the scenario was deployed as VR or written format we find presence to be not significant, realism to be significant but with a small effect size, and actually the way the scenario was deployed to be the variable with the largest effect size. Specifically we see that those in the VR condition reported much higher positive affect scores (Table 2).

Table 2: Model results for PANAS score associated with Presence and Realism

|          | Model 1: Positive score |            |         |         | Model 2: Negative score |            |         |         |
|----------|-------------------------|------------|---------|---------|-------------------------|------------|---------|---------|
|          | Estimate                | Std. error | t-value | p-value | Estimate                | Std. error | t-value | p-value |
| Presence | 0.05096                 | 0.07592    | 0.671   | 0.5030  | 0.19707                 | 0.08037    | 2.452   | 0.0153* |
| Realism  | 0.39398                 | 0.17182    | 2.293   | 0.0232* | 0.21504                 | 0.18096    | 1.188   | 0.2366  |

|                                                        |         |         |       |         |                                                       |         |        |        |
|--------------------------------------------------------|---------|---------|-------|---------|-------------------------------------------------------|---------|--------|--------|
| VR scenario (reference = written)                      | 2.98370 | 1.16025 | 2.572 | 0.0111* | -0.59126                                              | 1.21799 | -0.485 | 0.6281 |
| Adjusted R-squared: 0.09105                            |         |         |       |         | Adjusted R-squared: 0.06718                           |         |        |        |
| F-statistic: 6.209 on 3 and 153 DF, p-value: 0.0005235 |         |         |       |         | F-statistic: 4.697 on 3 and 151 DF, p-value: 0.003644 |         |        |        |

Indeed we see participants reporting higher positive scores in VR scenarios (estimate = 2.98370,  $t = 2.572$ ,  $df = 153$ ,  $p\text{-value} = 0.0111$ ), but no such difference in their negative scores (estimate = -0.59126,  $t = -0.485$ ,  $df = 153$ ,  $p\text{-value} = 0.6281$ )

People felt positive emotions experiencing VR, even though the scenario was not a positive one. This is reflected in the qualitative comments, where participants commented on the situation of the VR, rather than the content of the vignette:

*"[I felt] excited first and I felt like it will be a reality in the future we can take an online course it's like blended learning with online learning, and can study together. " P035; female; student; vr*

This suggests that some participants may be distracted by the mode of delivery while VR technology is novel. This novelty may distract participants who may miss more subtle experimental manipulations.

To sum up all our results, Table 3 summarises the key findings from our analysis.

| Theme                                                 | Result                                                                               | Key Statistics                                                                    | Interpretation                                                                                                                             |
|-------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Interpretation of Staring as Sexual Harassment</b> | Classification of scenario as sexual harassment increases slightly with intervention | Control: 13% yes; Indirect: 25%; Direct: 26%.<br>$\chi^2(4)=7.48$ , $p=.113$ (ns) | Interventions doubled recognition, but low base rates and non-significance suggest the staring scenario was not seen as strong harassment. |
|                                                       | Qualitative reasons for low recognition                                              | — (qualitative)                                                                   | Participants saw staring as “not as scary” or lacking sexual intent (i.e., “people stare all the time.”                                    |

|                                            |                                                    |                                                                          |                                                                                                                   |
|--------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Interpretation of Intervention</b>      | Whether participants thought any bystander noticed | Significant difference across groups: $\chi^2(4)=96.63$ , $p<.001$       | Scenarios functioned as intended: direct intervention highly visible, indirect less so, control none.             |
|                                            | Bystander noticed: direct vs indirect              | Direct: 90% yes; Indirect: 55% yes. $\chi^2(2)=17.76$ , $p<.001$         | Direct intervention is more visible than indirect intervention.                                                   |
| <b>Evaluation of Intervention</b>          | Perceived helpfulness of intervention              | Direct: 81% helpful; Indirect: 72% helpful. $\chi^2(2)=80.35$ , $p<.001$ | Direct intervention rated more helpful statistically, but qualitatively no strong preference.                     |
|                                            | Qualitative perceptions of helpfulness             | (qualitative)                                                            | Both interventions were sometimes seen as intrusive, awkward, or insufficient; reactions varied person-to-person. |
| <b>Emotions (Self-Report)</b>              | PANAS positive affect across scenarios             | Model ns: $F(2,155)=2.248$ , $p=.1091$                                   | Scenario type did not change positive emotions.                                                                   |
|                                            | PANAS negative affect across scenarios             | Model ns: $F(2,153)=0.159$ , $p=.8531$                                   | Scenario type did not change negative emotions.                                                                   |
|                                            | Overall emotional impact of intervention           | (qualitative)                                                            | Experiencing harassment set an emotional tone; intervention type did not alter emotional consequences.            |
| <b>Physiology (Heart Rate Variability)</b> | HF(log) change: intervention differences           | ANOVA: $F(2,73)=3.76$ , $p=.03$ ; Direct < Control (Tukey $p=.02$ )      | Direct intervention associated with <i>smaller</i> HRV change (lower stress response) than control.               |
| <b>Physiology (Skin Conductance / EDA)</b> | EDA change across scenarios                        | $t(153)=-0.093$ , $p=.93$ ; ANOVA $F(2,75)=0.07$ , $p=.93$               | No physiological arousal differences across conditions.                                                           |

|                                               |                                    |                              |                                                                                   |
|-----------------------------------------------|------------------------------------|------------------------------|-----------------------------------------------------------------------------------|
| <b>Relationship between Measures</b>          | Correlation: HRV and EDA           | $r(74) = .28, p = .013$      | HRV and EDA measure related but distinct arousal components.                      |
|                                               | Correlation: PANAS vs physiology   | All ns                       | Self-report emotions do not align with physiological markers.                     |
| <b>Realism &amp; Presence (VR vs Written)</b> | Realism                            | $t = -0.573, p = .5673$      | VR and written are perceived as equally realistic.                                |
|                                               | Presence                           | $t = 4.5737, p = 0.00009667$ | VR increases the sense of presence.                                               |
| <b>Affect &amp; Immersion</b>                 | VR effect on positive affect       | $t = -2.884, p = .004478$    | VR increases <i>positive affect</i> , likely due to novelty/immersive experience. |
|                                               | VR effect on negative affect       | $t = -0.266, p = .79003$     | No VR effect on <i>negative</i> emotions.                                         |
|                                               | Presence effect on negative affect | $t = 2.452, p = .015$        | Higher presence increases negative emotional intensity.                           |
|                                               | Realism effect on positive affect  | $t = 2.293, p = .0232$       | More realistic scenarios slightly increase the positive affect.                   |
|                                               | Scenario format effect             | $t = 2.572, p = .0111$       | Platform (VR vs written) more influential than realism or presence.               |

Overall, most people reported any intervention was helpful, and we cannot conclude victims perceive indirect and direct interventions differently. Positive and negative affect also did not differ across conditions, suggesting the harassment itself, rather than the bystander action, shapes victims' emotional responses in the moment. While direct intervention produced a small HRV difference, neither HRV nor EDA patterns indicated meaningful physiological change across conditions. These physiological findings may partly reflect VR-related artefacts such as cybersickness or novelty effects (Kim et al., 2022), or raise concerns that low-intensity behaviours like staring may not substantially shift emotional tone (e.g., Bursik, 1992; Gutes, 1995). Taken together, the results indicate that although bystander action is recognised and appreciated, it does not matter

whether it is direct or indirect considering the ability to materially alter victims' immediate perceptions or emotional experience.

## Discussion

Bystander intervention programs are used as a key method in the prevention of sexual harassment on university campuses. However, little is known about the efficacy of bystander intervention from the victim's perspective. The primary aim of this study was to examine how victims perceive different types of bystander intervention in situations involving low intensity harassment (i.e., leering). Overall, our findings suggest that bystander action was noticed and appreciated by victims, but the type of action (direct or indirect) did not affect victims' immediate perceptions of the situation, nor the emotions they experienced during the scenario. Direct intervention was more visible and more often rated helpful than indirect, but qualitative accounts showed ambivalence: intrusive for some, insufficient for others. This is in line with other research which finds victims often hold mixed, ambivalent, or even negative feelings about bystander intervention (Fileborn, 2017; McMahon, 2024). While we might expect indirect "protective" actions to be seen as supportive, victims may still experience mixed consequences (Moschella & Banyard, 2020) and overly confrontational interventions can escalate tension or make victims feel worse (Emery et al., 2017; Emery & Wu, 2020). Another element of frustration we picked up from the qualitative comments came from the inaction of the other bystanders, even in cases where the one bystander intervened. Such frustration aligns with diffusion of responsibility, as victims may interpret others' silence as a collective withdrawal from responsibility (Liu et al., 2022).

Self-reported and physiological measures of affect told slightly different stories. Across scenarios, PANAS scores showed no differences in positive or negative affect between control, direct, and indirect conditions, indicating that participants felt similarly regardless of intervention style. Only heart-rate variability showed a small scenario effect, with the direct-intervention group exhibiting a smaller HF(log) change than controls. EDA showed no differences across conditions. The tiny effect side showing that direct intervention lowered stress measured with heart rate may be that the effect is small, or could be due to the variation between people. Qualitative results showed some participants annoyed by the direct interventions, while others found it helpful. Those who reacted negatively may 'balance out' those who felt reassured.

The two physiological indicators correlated only modestly, and neither correlated with self-reported affect, replicating prior work showing that self-report and physiology often diverge (Kim & Kang, 2018; Li et al., 2018), and emotional processing can be subconscious so physiological measures reveal responses not captured in self-report (Beck & Egger, 2018; Bolinski et al., 2024).

Importantly, to make a methodological contribution, we considered how exposure to the VR scenarios might affect emotional and physiological responses from our participants differently to written scenarios. VR changed how participants *experienced* the scenario, even when it did not change how they *interpreted* it. Presence was markedly higher in VR than in written form, while realism did not differ between formats. This

echoes earlier work showing that VR heightens immersion without altering perceived authenticity of the scene (van Gelder et al., 2019). Higher presence was also linked to stronger negative affect, but deploying the scenario in VR versus written format produced higher positive affect regardless of intervention type, suggesting the medium added emotional intensity unrelated to the harassment content. Together, these results show that VR amplifies how “in” the situation participants feel and shapes emotional responses even when the scenario and its meaning remain the same, but also suggests it may be distracting if participants focus on the novelty and they may miss more subtle experimental manipulations.

## Implications of results

Collectively, our findings have important implications for bystander action. First, we found that from the victim perspective, doing *something* (whether directly or not) is viewed as more helpful than doing nothing in trying to disrupt sexual harassment. Second, indirect intervention was perceived to be helpful by the majority of respondents exposed to this scenario. A consistent finding in bystander research is that bystanders may be hesitant to intervene directly due to perceived risks to their own safety (see Kuskoff & Parsell, 2024; Robinson et al., 2022). Understandably, bystanders do not want to put themselves in a potentially dangerous situation. Our findings may help to allay some of the fear and hesitancy in bystanders by encouraging indirect intervention, thereby keeping both victims and bystanders safe from further harm. Methodologically, our results show that while VR can meaningfully heighten presence, but may introduce unintended emotions due to its novelty to participants. Scenarios with subtle or low-intensity stimuli may need longer baseline exposure, or stronger or more targeted manipulations. We also demonstrate the value of collecting physiological and self-report data in parallel, as each captures different aspects of emotional processing that would be missed if used alone.

## Limitations

The current research is not without limitations. VR was novel for many participants; in the UK, where our study took place, 6% of adults report owning a VR headset, with only 3% claiming to actually use one themselves (Kantar Media, 2023). This unfamiliarity may have amplified physiological responses or introduced artefacts, despite our use of a baseline immersion scenario. Duration of VR exposure may further matter, as heart-rate values shift with time spent in virtual environments (Malińska et al., 2015), suggesting that both baseline and scenario segments may have been too short to stabilise physiological markers.

Weak and inconsistent EDA results could also be attributed to issues with environmental stressors, specifically issues with temperature and humidity regulation in the VR facility, which meant we had to use the coarse measure of mean EDA, rather than more sophisticated operationalisations of this measure.

While the majority of participants were women, we chose not to explicitly exclude men or non-binary people. This is in line with evidence showing that students of all genders can be victims, perpetrators, or bystanders, even though prevention efforts often default to portraying men as perpetrators and women as victims (Kettrey

et al., 2024). Because the scenarios held constant the genders of the perpetrator and bystander, we could not observe the gendered dynamics that influence bystander recognition and action, including differences in how interventions are judged credible, appropriate, or risky (Kettrey et al., 2024). Replicating this design with varied gender combinations would allow a clearer mapping of how gender shapes victims' experiences and the efficacy of different intervention styles.

Finally, the null findings for intervention type should be interpreted with care: low-intensity harassment, combined with the novelty of VR may have reduced our ability to detect subtle differences between direct and indirect actions.

## Future directions

Future research can build on this study through replication with varied scenarios and environments, as well as by expanding measurement approaches. Eye-tracking could help reveal where victims and bystanders direct their attention. Physiological measures should be collected both within and outside VR to distinguish genuine emotional responses from VR-related artefacts. These scenarios should also be tested in public settings (buses, trains, bars, streets) to examine bystander intervention in the environments where harassment most often occurs.

## Conclusion

This study suggests that while VR can enhance presence and emotional intensity, it may also obscure differences between intervention types. Victim perceptions of bystander actions are diverse, and no one-size-fits-all strategy exists. These findings call for nuanced public messaging around bystander engagement and further research on tailoring interventions to individual needs.

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