Validation of a professional virtual environment lo learn soft skills

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INTRODUCTION

Soft skills as communication, emotion regulation, cooperation, assertiveness, and empathy are considered as critical as technical skills for adapting to constantly evolving professional environments. Soft skills can be understood as encompassing both intrapersonal and interpersonal competencies (for a systematic review, see Marín-Zapata et al., 2022). Intrapersonal soft skills refer to abilities involved in self-management, such as independence and self-actualization. In contrast, interpersonal soft skills concern abilities that facilitate interactions with others, including communication, cultural competence, conflict resolution, and facilitation.

Using virtual reality (VR), this study aims at assessing the validity of virtual work environments (i.e., a meeting room) that simulate self-assertiveness and self-presentation (i.e., soft skills) with colleagues and manager. Virtual reality (VR) is a computer technology that represents an immersive artificial environment which requires devices such as special headsets to immerse users in three-dimensional virtual worlds (Emmelkamp & Meyerbröker, 2021). In psychology, virtual reality exposure therapy (VRET) uses immersive virtual environments to simulate anxiety-provoking scenarios. By replicating real-world situations, VR enables psychologists to create tailored and customizable exposure scenarios that closely resemble the specific triggers of anxiety (Ma et al., 2021). VR has been shown to be effective in the treatment of cognitive, psychological, motor and functional impairments for psychiatric disorders (for a meta-review of meta-analyses, see Dellazizzo et al., 2020) in a wide range of clinical conditions including emotion regulation (for reviews, see Colombo et al., 2021; Montana et al., 2020).

To create an effective virtual environment, it is crucial to ensure strong immersive properties—minimizing cybersickness while enhancing presence (Della Libera et al., 2023). Therefore, the present study evaluated whether a virtual work meeting could be used for soft skills training by assessing its ability to (1) elicit relevant emotional responses, (2) foster presence, and (3) reduce cybersickness. Testing this environment in a non-clinical sample represents a necessary step before their ethical application in clinical interventions. We hypothesized that the virtual meeting should elicit more negative emotions such as anxiety, anger, discouragement and guilt in participants, compared with a control environment (i.e., familiarization immersion environment). To ensure that observed effects were attributable to the manipulated virtual environments, rather than individual predispositions, we included immersive tendencies and fear of negative evaluation as covariates in our analyses.

METHOD

Participants : 32 participants (16 females) on sick leave aged from 22 to 61 years old (*X* = 34.22, *SD* = 12,98) took part in the study. They completed a 60-minute VR session simulating common workplace interactions during a meeting with a team manager and colleagues.

Procedure :

Participants first completed pre-immersion questionnaires (sociodemographic questions, immersive tendency, and fear of negative evaluation) online (via Limesurvey). During the VR session, at T0, they were immersed in the control environment (see Figure 1) and completed the cybersickness and negative emotions (fear, discouragement, anger, and guilt). From T1 to T6, they attended a meeting (see Figure 1) in which they were asked to respond to colleagues (see Figure 2 for the different tasks requested). After each task, negative emotions were measured. After T6, measures of feelings of presence and cybersickness were taken.

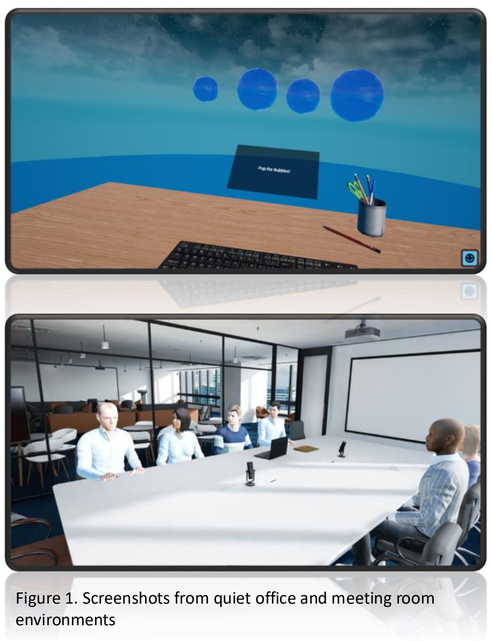

Figure 1. Screenshots from quiet office and meeting room environments

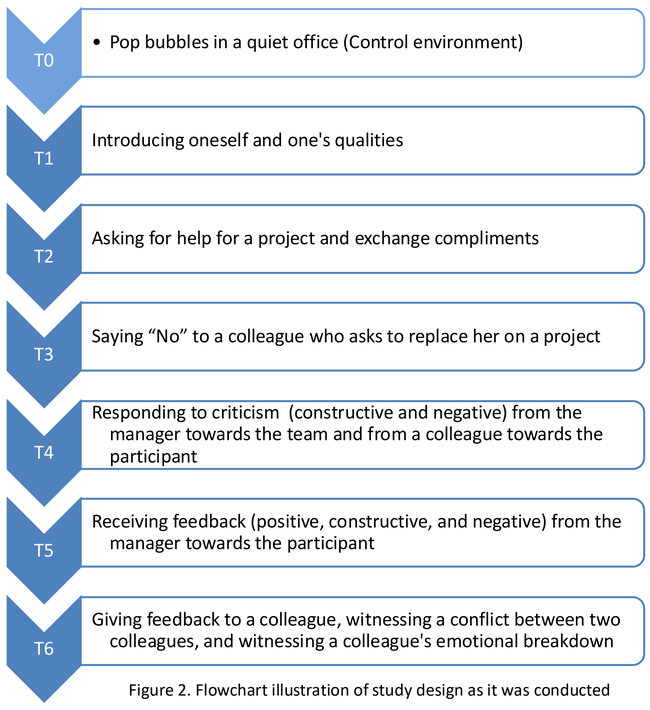

Figure 2. Flowchart illustration of study design as it was conducted

Measures :

- **Immersive tendencies** measured by the validated French version of *The Immersive Tendencies Questionnaire* (ITQ; Witmer & Singer, 1998) which assesses one’s tendency to shut out external distractions to focus on different tasks in daily life.
- **Fear of negative evaluation** (FNE) measured using the validated French version of the FNE Scale (Watson & Friend, 1969; Douilliez et al., 2008).
- **Negative emotions** assessed by the Subjective Unit of Disturbance Scale (SUDS) for emotional comfort (SUDS-comfort), anxiety (SUDS-Anx), discouragement (SUDS-D), anger (SUDS-Ang) and guilt (SUDS-G). For all SUDS, participants answered with anchor points at 0-1 “Not at all”, 2-3 “A little”; 4-6 “Moderately”; 7-8 “A lot”, and 9-10 “Totally”.
- **Sense of presence** measured by the Four presence dimensions (Wagener and Simon, in preparation cited in Libera et al., 2023) including “place illusion” (i.e., the sense of being in the place); “plausibility illusion” (i.e., the feeling that the scenario is actually taking place); “copresence illusion” (i.e., the sense of sharing the environment with other characters); and “social presence illusion” (i.e., the feeling that a psychological link exists between oneself and the other characters).
- **Cybersickness** measured by the French version of the Simulator Sickness Questionnaire (SSQ; Bouchard et al. 2011; Kennedy et al., 1993) with 2 subscales : (1) nausea (e.g., increased salivation) and (2) oculomotor symptoms (e.g., eye fatigue).

RESULTS

Table 1 shows mean scores of presence and cybersickness. Results indicated overall low scores before and after the whole process of immersion, even if nausea increased significantly with exposure ($t(32) = -4.83$, $p<.001$) as well as oculomotor symptoms ($t(32) = -5.53$, $p<.001$). Presence showed moderate to high scores for all four dimensions.

		Pre-immersion Mean (SD)	Post-immersion Mean (SD)
Presence	Place Illusion		18.75 (6.26)
	Plausibility illusion		15.16 (6.01)
	Copresence illusion		14.56 (5.81)
	Social presence illusion		14.96 (5.73)
SSQ	Nausea	0.47 (.84)	2.03 (2.07)
	Oculomotor	2.44 (2.66)	4.88 (4.07)

Table 1. Descriptive statistics for immersive properties (i.e., presence and cybersickness)

Concerning negative emotions, first, results showed that anxiety differed significantly between the interpersonal tasks with the Greenhouse-Geisser correction ($F(3.62, 112.08) = 20.77$, $p < .001$, $\eta^2 = .40$), as well as discouragement = ($F(4.24, 131.36) = 12.22$, $p < .001$, $\eta^2 = .28$), anger ($F(4.39, 136.00) = 8.92$, $p < .001$, $\eta^2 = .22$) and guilt ($F(3.98, 123.42) = 19.61$, $p < .001$, $\eta^2 = .39$). Figure shows means for each negative emotions.

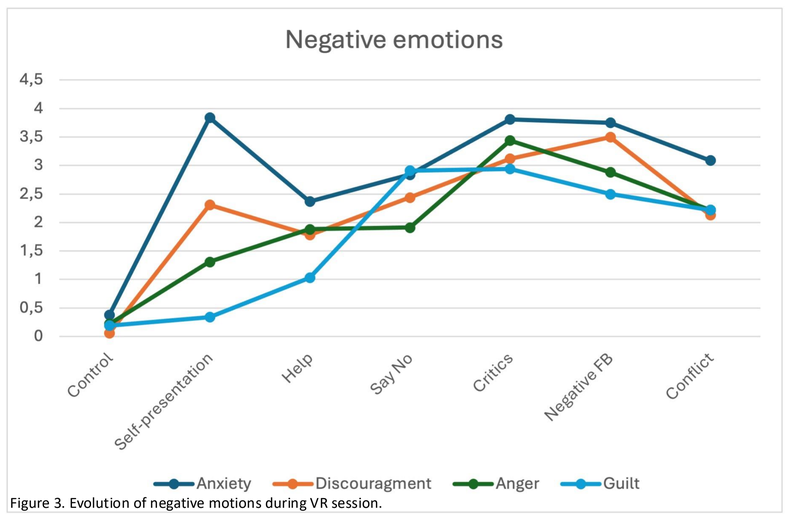

Figure 3. Evolution of negative motions during VR session.

When controlling for immersive tendencies and FNE, the results showed that anxiety, anger and guilt no longer differ significantly between the interpersonal tasks (see Table 2). However, we found an effect of the FNE as a covariate on the interpersonal tasks for anxiety, anger and guilt. Concerning discouragement, when controlling for immersive tendencies and FNE, it differed significantly between the interpersonal tasks ($F(6) = 3.33$, $p = .004$, $\eta^2 = .10$) and we found an effect of the immersive tendencies and FNE as a covariates on the interpersonal tasks.

	Differences between tasks	Covariate effects
Anxiety	(F(4.00, 116.19) = 1.89, p = .22)	FNE : (F(4.00, 116.19) = 6.58, p < .001, η^2 = .19)
Discouragement	(F(6) = 3.33, p = .004, η^2 = .10)	ITQ : (F(6) = 2.42, p = .03, η^2 = .08) FNE : (F(6) = 5.65, p < .001, η^2 = .16)
Anger	(F(4.48, 129.96) = .74, p = .62)	FNE (F(4.48, 129.96) = 4.24, p = .002, η^2 = .13)
Guilt	(F(3.89, 112.84) = .56, p = .69)	FNE (F(3.89, 112.84) = 3.29, p = .01, η^2 = .10)

Table 2. Results (controlling for immersive tendencies (ITQ) and fear of negative evaluation (FNE)

DISCUSSION

Overall, the virtual interpersonal tasks in the meeting situation showed good immersive proprieties (i.e., adequate levels of sense of presence and cybersickness) and elicited negative emotions, as all four dimensions (anxiety, discouragement, anger, guilt) significantly differed across tasks. This confirms that the environments can reliably induce emotional variability, which is a prerequisite for their use in training and clinical applications. However, when controlling for immersive tendencies and Fear of Negative Evaluation (FNE), the picture changes. Only discouragement continued to differ significantly between tasks, suggesting that this emotion is particularly sensitive to situational variations within the environments. For anxiety, anger, and guilt, task-related differences disappeared, indicating that individual factors—especially FNE—play a stronger role than the tasks themselves. Indeed, FNE consistently predicted higher levels of anxiety, anger, and guilt, highlighting its central role in shaping emotional responses to social situations. Together, these findings suggest that while the environments are effective in eliciting negative emotions, their impact is partly dependent on individual vulnerability factors. This supports their potential for training purposes but also underscores the importance of tailoring interventions by considering personal characteristics such as FNE.

Future research should examine the effectiveness of the meeting environment as a soft skills training tool for individuals with interpersonal skill deficits. A first step would be to compare VR-based soft skills training with traditional approaches. To assess intervention efficacy, in addition to self-reports, more objective measures of soft skills should be included (e.g., behavioral coding of verbal and non-verbal interactions within the virtual environment). Indeed, VR offers the advantage of allowing individuals to practice skills in a safe and controlled setting (Oliveira et al., 2021). It also facilitates observation, evaluation, and feedback on performance (Chang et al., 2023), with trained skills often transferring to real-world contexts (see reviews: Chang et al., 2023; Oliveira et al., 2021).

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