

PAPER

All Talk and No Action? Effects of Implementing Counseling Training in Virtual Reality in a Controlled Pre-test–Post-test Study

Kristian Träg* ,
Miriam Mulders* ,
Dominik Evangelou 

University of Duisburg-Essen,
Essen, Germany

kristian.traeg@uni-due.de

ABSTRACT

Virtual reality (VR) has been proposed as a promising tool to enhance social competences in higher education, especially in resource-constrained counseling seminars. This study investigates the effects of a single-session VR-based training on university students' counseling competence and self-efficacy. Forty-five students took part in a standardized counseling scenario delivered through a realistic social VR environment, interacting with a trained actor in real time. Pre- and post-training questionnaires assessed changes in self-efficacy and counseling competence, alongside measures of presence, realism, cognitive load, and perspective-taking. Results showed small, non-significant improvements in both outcome variables. Regression analyses revealed that perceived realism significantly predicted counseling competence, while presence and extraneous cognitive load influenced perspective-taking. However, the limited duration of the intervention and the absence of a control group constrain causal inferences. Despite these limitations, the study provides initial empirical support for the integration of VR technologies into counselor education and outlines key factors for effective implementation. Future research should explore adaptive, Artificial Intelligence (AI)-enhanced VR environments that allow for repeated practice and personalized feedback to fully realize the potential of VR in social skills training.

KEYWORDS

counseling, counseling training, virtual reality (VR), social skills

1 INTRODUCTION

Seminars are a frequently implemented setting in higher education, often used to supplement lectures and provide more hands-on practical experience [1], [2]. However, university seminars are often constrained by lack of time or equipment, large group sizes, lack of feedback given by the teachers, and insufficient integration of practical components [3]. This is especially true for fields like social skills training,

*These authors contributed
equally to this work.

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where students often have to practice techniques in role play on each other. Additional challenges from this are a lack of authenticity of the practice scenarios and poor quality of training, since most students are not trained actors [4]. Overall, traditional methods such as role play often lack ecological validity and fail to provide individualized or repeated practice opportunities [1]. In addition, students are frequently reluctant to engage fully in group-based exercises due to social anxieties, fear of negative evaluation, or discomfort with peer observation [4]. These factors can detract from the actual learning objective: the practice and refinement of social skills. This holds true for a range of fields where social skills are key, including social work, psychotherapy, teaching, and, most notably, counseling, which is the main focus of this paper.

One somewhat recently popularized technology that may lend itself to social skills training in general and counseling training specifically is virtual reality (VR) [5]. In contrast to in-person role play, VR may be able to simulate authentic, emotionally engaging, and standardized counseling scenarios, allowing learners to apply conversational techniques such as mirroring, summarizing, and active listening in a realistic yet low-risk environment. One of the key advantages of VR as a learning tool lies in its potential for repeated, individualized practice [6]. Such repetition is a crucial factor in skill consolidation and long-term retention, particularly in social and communicative domains [7], [8], [9]. Unlike traditional seminars, where students may only have a limited number of opportunities to apply counseling techniques, VR enables learners to revisit the same scenario multiple times, make videos of these, review them in detail scene by scene, receive feedback, and incrementally refine their skills. In addition to the restricted opportunities for practical training, the amount and quality of feedback in traditional settings are often limited by the supervisory capacity of a single instructor responsible for many students. Moreover, students typically practice in non-authentic environments, such as large seminar rooms with the entire class present, which do not resemble real counseling settings and may hinder effective skill development. Some training programs for social skills based in VR seem to already have been proven effective [5], [10], [11]. However, research on VR applications specifically designed for counseling training is rather scarce. The present paper aims to expand into this study gap by examining the efficacy of social VR to facilitate counseling training. First, the research on social skills training in VR will be reported. Following that, current trends in counseling training will be presented, and requirements for VR-based counseling training will be laid out.

2 THEORETICAL BACKGROUND

2.1 Social skills in VR

Virtual reality is an immersive technology that allows learners to explore three-dimensional virtual environments [12]. This type of educational tool lends itself to learning social skills, which are particularly relevant in fields like counseling. VR might have the potential to promote social skills relevant for counseling. One area in which this potential has already been demonstrated is public speaking, where multiple studies show that VR can be an effective tool for skill improvement [4], [13], [14]. Similar effects have been observed in teacher education: Huang et al. [15] report an increase in interest and self-efficacy among student teachers when training classroom management skills in VR. The willingness and ability of teachers in training to use VR in the classroom can be further enhanced by applying generative learning strategies [16], [17]. Communication skills and empathy of medical practitioners may

also be improved through VR-based training [18]. Some studies have shown that VR can help reduce racial bias [19], [20], however, some have criticized this type of experience as inauthentic [21], [22]. Still, VR training might help recognize racially charged microaggressions and reduce insecurities about acting against them [23].

A meta-analysis by Howard and Gutworth revealed that VR-based training programs seem to be more effective in developing social skills than control groups, with gamified approaches faring slightly worse than non-gamified ones [5]. Another meta-analysis found that interventions aiming at improving social skills through VR were generally successful, however, effect sizes are higher for complex social skills than they are for simple social skills [24]. Overall, the empirical data suggests that VR has the potential to support the development of social skills in educational contexts. One of the contexts in higher education that might benefit from implementing such VR solutions is the training of counselors, which will be described in the following section.

2.2 Counseling training

Counseling describes an act of capacity building, or helping others help themselves, by providing orientation, defining goals, evaluating possible courses of action, or planning future steps [1]. It is an important skill for many educators, since learners in all stages of education might require assistance in finding an educational path that fits them. Fundamental conversational techniques commonly used in psychological counseling, such as active listening [25], are also highly relevant for educational counseling. According to C. R. Rogers [26], [27], acceptance, empathy, and genuineness constitute the foundational principles of therapy and, by extension, of counseling. (1) Acceptance refers to accepting the internal frame of reference of the client and meeting the client's perceptions, feelings, and cognitions with a positive attitude. (2) Empathy means understanding the client and communicating feelings openly. (3) Genuineness demands that a counselor remains authentic and does not feign appreciation. Other authors add principles such as confidentiality and the participant's willingness to engage as essential components of effective counseling [28], [29].

Becoming a skilled counselor takes practice [30]. Since there is an ongoing ethical debate about whether practicing on actual clients is appropriate, especially in cases where the counseling process touches on sensitive topics related to mental health, emotional distress, or personal privacy [28], [31], many university courses that teach counseling rely on role-play as a central instructional method [1], [4], [32]. Role-play requires learners to adopt a specific role and serves as an accessible pedagogical technique that follows a learning-by-doing approach. It encourages learners to engage with real-life situations from multiple perspectives [33]. However, role play comes with its own variety of drawbacks. Students may find it challenging to fully immerse themselves in role-played counseling situations, particularly when the client description does not align with the student's own characteristics or experiences. Additionally, not all students feel comfortable with improvisation, and some struggle to convincingly portray a counseling scenario. In large seminar settings, learners are often reluctant to take on roles in front of their peers due to embarrassment or fear of being judged for their performance [4]. While some university students report that role-play is engaging, easy to understand, and helpful in preparing for real-world interactions, others describe discomfort with performing in front of larger groups [33]. Similarly, Schmid Mast et al. [4] point out that students may hesitate to participate in role-play exercises in front of their peers due to embarrassment or fear of negative evaluation, which are factors that can significantly reduce the effectiveness of this method in larger classroom settings. Given the limitations of traditional role play,

particularly regarding limited institutional resources such as time and space, virtual environments are gaining traction as a promising tool for teaching counseling and related techniques. These theoretical considerations are further supported by a growing body of empirical evidence highlighting the potential of VR in educational settings. In an empirical study with 176 student teachers, for example, participants reported an increased sense of self-efficacy and satisfaction after using a VR classroom environment [34]. Additionally, students at the Vienna University of Economics and Business reported that they find virtual learning environments motivating and would be willing to use them in their studies [35]. Overall, the research presented suggests that teaching counseling skills through immersive VR is worth investigating. Factors that might influence such training will be examined in the following section.

2.3 Determinants of counseling training in virtual reality

Considering the previously laid out benefits of VR on social skills development, implementing counselor training in VR might yield positive results for learners' counseling competence, building on the strengths of educational role play while minimizing its downsides [32], [33]. The upside of VR lies in its ability to increase motivation, self-efficacy, and embodiment, which in turn positively affect learning outcomes [12]. For example, S.L. Rogers et al. [36] found that undergraduate students responded positively to a VR training in which they took on the role of student counselors. Participants described the experience as engaging, indicating an increase in learning motivation. These findings suggest that VR can support increased motivation in counseling training, potentially offering an advantage over traditional role-play formats [4]. Moreover, evidence from Stiefelbauer et al. [35] suggests that student teachers show higher motivation to engage with VR-based learning environments. This is particularly relevant as engagement in VR has been linked to increased empathy [37], which is a core competence in the counseling profession [27]. In immersive learning environments, engagement is often linked to perspective-taking and emotional resonance, both of which are fundamental to the development of empathy. Indeed, numerous studies confirm that VR learning can positively impact empathic development. For example, Calvert and Abadia [38] report that a higher degree of immersion related to a higher sense of empathy, engagement, presence, and knowledge mastery. The positive effect of perspective-taking on positive attitudes when learning about stereotypes in VR is mediated by empathy [39]. A meta-analysis [40] shows that a higher degree of immersion is related to higher emotional empathy, but not cognitive empathy. Empathic reactions seem to be affected by perspective-taking [41], [42], which can in turn be improved by higher degrees of immersion in VR [43]. Overall, there is strong support that immersion promotes empathy [37], [38], [40], [41], [44].

Apart from empathy, another relevant factor of counseling training is self-efficacy [45]. Empirical evidence suggests that self-efficacy can be enhanced through VR experiences. For instance, a training exercise on earthquake preparedness increased participants' self-efficacy by fostering spatial presence and immersion [9]. However, another study did not find a link between spatial presence and self-efficacy in student teachers when learning in a VR classroom [46]. The amount of bodily movement during a VR experience might also be linked to increased self-efficacy and behavioral intent regarding climate action [47]. One more factor that influences learning through VR experiences is the fidelity or realism of the virtual environment. Fidelity is linked to higher knowledge acquisition [48], affective learning [49], and training transfer [4]. Finally, the working alliance, or the collaborative and therapeutic relationship between client and counselor, has also been shown to benefit from

virtual environments [50], [51]. Taken together, the research presented suggests that VR-based training holds significant potential for the specific demands of counseling education.

However, not all studies report exclusively positive effects of VR on learning outcomes. While increased body movement within VR environments has been associated with higher self-efficacy and behavioral intention, some findings suggest that it may have a negative impact on overall learning performance [47]. Additionally, many studies have shown that VR tends to increase cognitive load and motion sickness [52], [53], [54], [55], [56]. Especially novice VR users might be overwhelmed with learning in a virtual environment [57], [58], [59]. For this reason, potential moderating effects such as prior experience with VR and cognitive load should be taken into account when implementing VR in counseling training.

Overall, the empirical research so far suggests that training in VR could be beneficial for students' counseling competence, self-efficacy, and social skills. It marks the heightened sense of presence, realism, and perspective-taking as strengths of this educational setup. Specifically, VR-based counseling training might be able to address many of the weaknesses of the currently very common educational setup, i.e., large groups, overreliance on role play, limited resources of supervisors, and lack of authentic learning situations [1], [4], [33], while playing into one of the core strengths of VR as a technology, namely the possibility to practice skills in a realistic but safe environment before meeting actual clients [32], [34]. Implementing counseling training in VR may therefore help improve the quality of seminars in higher education while offering students a more engaging way of learning. In addition, VR training may contribute to closing the gap between skill acquisition in academic contexts and their practical application in the workplace. The present paper aims to contribute to the still nascent body of research on VR-based counseling training in higher education by investigating the effects of such a training on university students' self-efficacy and counseling competence. The next section states the hypotheses regarding those constructs.

2.4 Hypotheses

The present study aims to shed light on the effectiveness of VR-based counseling. A counseling intervention could be considered successful if counseling competence and self-efficacy have increased, which has empirically been shown to be possible [9], [47], [50]. We assume that the present intervention will be effective.

H1: Counseling competence and self-efficacy will increase from pretest to posttest.

The sense of presence conveyed by and the realism or fidelity of the VR environment can generally be considered as predictors for perspective-taking, counseling competence, and self-efficacy [4], [12], [38], [39], [40], [48], while those outcome variables are negatively affected by extraneous cognitive load [44], [52], [55], [56].

H2a: Presence and Realism positively affect perspective-taking, counseling competence, and self-efficacy.

H2b: Extraneous cognitive load negatively affects perspective-taking, counseling competence, and self-efficacy.

As novice users are more likely to be overwhelmed by VR [57], [58], [59], prior experience with the technology and self-efficacy should mitigate cognitive load.

H3: Prior experience with VR and self-efficacy negatively affect extraneous cognitive load.

Some research suggests a link between empathy and perspective-taking [39], [41], [42]. We expect to be able to replicate these findings in the present paper.

H4: Empathy positively affects perspective-taking.

Our review of literature found that presence and realism may be related to extraneous cognitive load [49], [52], [56]. This should be moderated by prior experience with VR technology [57].

H5a: Presence and realism negatively affect extraneous cognitive load.

H5b: Prior VR experience moderates the negative effect of presence and realism on extraneous cognitive load.

3 MATERIALS AND METHODS

3.1 Design and context

This study was conducted as part of the research project *VR-Hybrid*, which aims to explore the educational potential of VR for training counseling competence in higher education. The current analysis focuses on the effectiveness of a single-session VR intervention designed to enhance students' counseling competence and self-efficacy. The training took place in January 2025 in a university laboratory setting using the *Meta Quest 3* VR system. The session was embedded within university seminars that aimed to introduce fundamental counseling techniques in educational science programs. The study followed a one-group pretest-posttest design. Prior to data collection, the study was preregistered on *Open Science Framework* (OSF).¹

3.2 Participants

Participants were 46 undergraduate students enrolled in education science programs at the University of Duisburg-Essen in Germany. One participant who experienced motion sickness and withdrew during the intervention was excluded from the final sample. The resulting sample ($N = 45$) was predominantly female ($N = 39$, 86.7%), with a mean age of $M = 24.5$ years ($SD = 8.7$). Participants were recruited via course announcements and participated voluntarily in exchange for course credit. Written informed consent was obtained from all individuals, and ethical approval was secured through institutional procedures. Participation could be withdrawn at any time without any negative consequences. Prior to completing the first questionnaire, participants created a four-digit personal code to enable pseudonymized data linkage across multiple time points.

3.3 Materials and measures

Participants were given 20 minutes to complete a counseling conversation with a virtual client named *Lena* (see Figures 1 and 2), portrayed by a trained student

¹ <https://doi.org/10.17605/OSF.IO/Z4WXB>.

assistant using the *Engage* social VR platform,² one of several commercially available platforms offering social VR environments for collaborative and interactive learning experiences [60]. Student assistants prepared extensively based on a standardized case vignette, ensuring consistent role portrayal, including gestures, emotional expression, and speech patterns. This standardization was essential to ensure comparable learning conditions and to maintain the authenticity and reliability of the simulated counseling experience. Participants received a briefing about *Lena*'s background and were asked to take on the role of a counselor addressing her professional uncertainty. The virtual setting was designed to resemble a real counseling room (e.g., seating arrangement, natural lighting, and decorative elements such as a plant; see Figure 3). English translations of all the material can be found in the online supplement.³



Fig. 1. Consulting situation from different perspectives inside VR



Fig. 2. Consulting situation outside VR

² <https://engagevr.io/>.

³ https://osf.io/kd2jg/?view_only=83d44fa082d4476482ecf945d005eb53.



Fig. 3. The consulting room with typical elements (e.g., couch, plant)

Students were instructed to apply specific conversational techniques previously taught in the seminar: summarizing, paraphrasing, mirroring, the use of “I-messages,” and various questioning strategies [25], [61]. These techniques had been introduced in an in-person session and a screencast presentation, ensuring all students received the same theoretical foundation. In previous semesters, each seminar was structured in such a way that theoretical content on counseling techniques and advisory situations was taught in a traditional, theory-based manner. Subsequently, case studies, often related to vocational education, were practiced in small groups or pairs.

3.4 Procedure

All training sessions were conducted individually. Participants were able to sign up for appointments separately. In the laboratory, participants first completed the pretest questionnaire, including demographics, prior VR experience, empathy, self-efficacy, and counseling competence.

Participants then engaged in the VR counseling session. During this time, they interacted with the standardized client *Lena* in the virtual counseling room. Student assistants and participants were located in separate rooms and did not meet in person.

After the VR training, participants completed the second questionnaire, which assessed self-efficacy, counseling competence, presence, realism, embodiment, perspective-taking, cognitive load, and engagement. A subsequent debriefing and third questionnaire were part of the original study design but are not analyzed in this paper [62], [63]. A more detailed description of the procedure and results pertaining to debriefing can be found in [62], [63], [64], [65], [66].

3.5 Measurement instruments

To measure changes in key dimensions of counseling-related learning and experience, a range of validated self-report instruments was utilized at different stages

of the study. Counseling competence and self-efficacy were measured at two time points (pre- and post-training), while other variables such as demographics, empathy, presence, realism, embodiment, cognitive load, and perspective-taking were collected either before or after the VR intervention.

Counseling competence was assessed using 22 items adapted from a scale originally developed by Hertel [67]. The items were revised to generalize beyond school-based counseling contexts and rated on an 8-point Likert scale ranging from 1 (*“does not apply at all”*) to 8 (*“fully applies”*). An example item is: *“I can structure a consultation in a way that is easy for the person seeking advice to understand.”* Self-efficacy in counseling contexts was measured with 9 items, adapted from the same source, and rated on a 6-point Likert scale (1 = *“strongly disagree”* to 6 = *“strongly agree”*). A sample item reads: *“I feel comfortable and confident in consultations.”* [67]. Trait empathy was measured at baseline using a short version of a standardized empathy scale [68], [69], with items such as *“I have warm feelings for people who are less well off than me.”* Responses were given on a 5-point scale ranging from 1 (*“never”*) to 5 (*“very often”*). Prior VR experience was assessed through a single item asking participants to indicate how frequently they had used VR technology before the study, using a 5-point scale from 1 (*“never used”*) to 5 (*“several times a week”*).

After the VR session, participants completed a second questionnaire that included process-related measurements. Presence was assessed using the Multimodal Presence Scale [70], [71], [72] with items such as *“The virtual environment seemed real to me,”* rated on a 6-point scale ranging from 1 (*“does absolutely not apply”*) to 6 (*“fully applies”*). Realism was captured through items focusing on graphical fidelity and environmental authenticity (e.g., *“Light and shadow in the virtual space were realistic.”*), rated on a 5-point scale from 1 (*“does absolutely not apply”*) to 5 (*“fully applies”*) [73]. Embodiment was assessed via items reflecting the degree of body ownership in VR [74], such as *“It felt as if the virtual body was my body.”* using a 7-point scale ranging from 1 (*“does absolutely not apply”*) to 7 (*“fully applies”*). Perspective-taking was measured using statements such as *“During the VR training, I had the feeling that I could put myself in the character’s shoes.”* also on a 7-point scale with the same endpoints [75]. Extraneous cognitive load was assessed with items adapted from [76], [77], including *“During the VR training, I had to work on many things in my head at the same time.”* using a 7-point scale ranging from 1 (*“completely wrong”*) to 7 (*“absolutely right”*). Engagement was assessed using items such as *“I would like to use the VR training again.”* on a 5-point scale ranging from 1 (*“does absolutely not apply”*) to 5 (*“fully applies”*) [78].

3.6 Data analysis

To test hypothesis 1, pre-post differences were assessed using t-tests. Linear multiple regression models were implemented for hypotheses 2 to 4, while moderation analysis based on linear multiple regression was used for hypothesis 5. All data analysis was performed in R version 4.2.2 [79], using the car [80], careless [81], ggplot2 [82], ggpmisc [83], interactions [84], lsr [85], and psych [86] packages.

4 RESULTS

4.1 Descriptive statistics

Table 1 shows descriptive statistics for all variables. All scales except trait empathy showed acceptable or good internal consistency according to Cronbach’s alpha [87].

The mean for every measure seems to land on the upper half of each of the scales, except for prior VR experience and extraneous cognitive load, which are noticeably lower. The table also shows that there is barely an increase for those variables that were assessed at both times of measurement, the statistical significance of which will be described in the hypotheses testing section.

Table 1. Descriptive statistics of all variables, t = measurement point

	Min	<i>Md</i>	<i>M</i>	Max	<i>SD</i>	α
Self-efficacy (t1)	2.38	4.13	4.06	5.75	0.82	.89
Self-efficacy (t2)	1.50	4.13	4.20	5.75	0.91	.92
Counseling competence (t1)	3.86	5.41	5.41	7.29	0.83	.94
Counseling competence (t2)	2.23	5.59	5.56	7.52	1.14	.96
Empathy (t1)	3.06	3.63	3.63	4.44	0.31	.55
Prior VR experience (t1)	1.00	1.00	1.47	4.00	0.69	X
Presence (t2)	1.13	3.87	3.85	5.80	1.04	.94
Realism (t2)	1.50	3.83	3.73	4.67	0.63	.85
Perspective-taking (t2)	2.17	5.50	5.34	7.00	1.06	.89
Extraneous cognitive load (t2)	1.00	2.67	2.92	6.33	1.22	.77

Table 2. Shapiro-Wilk tests for normal distribution

	Time	<i>W</i>	<i>p</i>
Self-efficacy	t1	0.98	.667
Self-efficacy	t2	0.97	.232
Counseling competence	t1	0.98	.72
Counseling competence	t2	0.96	.177
Empathy	t1	0.97	.193
Prior VR experience	t1	0.68	<.001
Presence	t2	0.98	.523
Realism	t2	0.94	.016
Perspective-taking	t2	0.90	<.001
Extraneous cognitive load	t2	0.93	.012

Note: Statistical significance is marked in boldface.

4.2 Hypothesis testing

A series of Shapiro-Wilk tests were implemented to check for normal distribution. Table 2 shows that prior VR experience, realism, perspective-taking, and extraneous cognitive load were not normally distributed.

Hypothesis 1 stated that there would be an increase in counseling competence and self-efficacy between pretest and posttest. Paired t-tests showed a small

but statistically not significant increase in self-efficacy between measurements, $t(44) = 1.64, p = .055, d = 0.24$. The same is true for counseling competence, $t(44) = 1.22, p = .114, d = 0.18$. Although the results are not statistically significant, they point in the expected direction, as depicted in Figure 4. We therefore reject hypothesis 1.

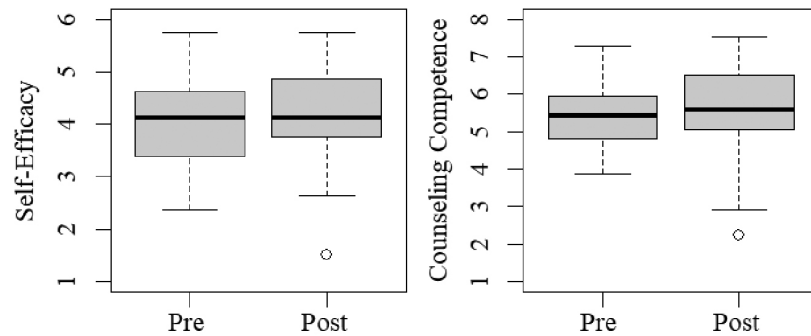


Fig. 4. Boxplots of self-efficacy and counseling competence

Hypothesis 2 stated that presence and realism would positively affect perspective-taking, counseling competence, and self-efficacy, while extraneous cognitive load would have a negative effect. Multiple regression analyses revealed that extraneous cognitive load and presence affected perspective-taking, while realism affected counseling competence. Self-efficacy was only tendentially affected by realism and extraneous cognitive load. Table 3 shows statistics from the regression analysis. Figure 5 shows the positive effect presence has on perspective-taking, while also demonstrating the negative effect of extraneous cognitive load. Both hypothesis 2a and hypothesis 2b are partially corroborated by this data.

Table 3. Hypothesis 2 multiple regression analysis

	<i>F</i>	<i>df</i>	Multiple/Adjusted <i>R</i> ²	<i>t</i>	Estimate	<i>p</i>
Perspective-taking model	13.95	3, 41	.505/.469	X	X	<.001
	Presence			3.40	0.47	.002
	Realism			−0.09	−0.02	.931
	ECL			−3.15	−0.34	.003
Counseling competence Model	6.35	3, 41	.317/.267	X	X	.001
	Presence			−1.02	−0.18	.312
	Realism			2.97	0.88	.005
	ECL			−1.72	−0.23	.093
Self-efficacy model	4.98	3, 41	.267/.213	X	X	.005
	Presence			−0.26	−0.04	.795
	Realism			1.99	0.49	.054
	ECL			−1.93	−0.22	.060

Note: ECL = Extraneous cognitive load. Statistical significance is marked in boldface.

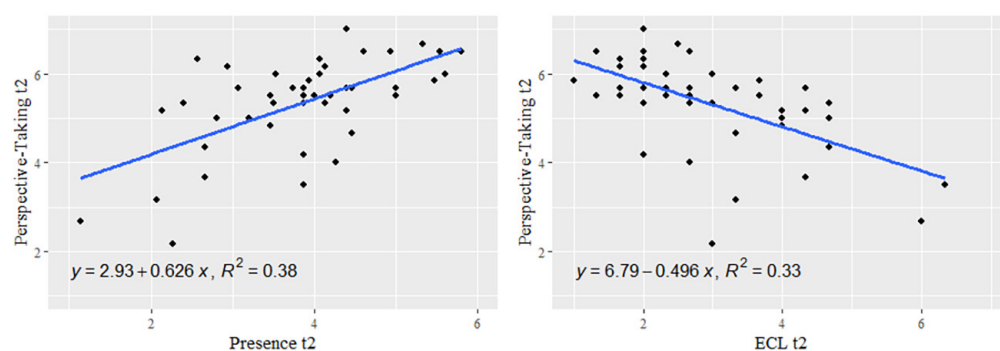


Fig. 5. Significant multiple regression for perspective-taking

Note: ECL – extraneous cognitive load, t2 – measurement point 2.

Hypothesis 3 stated that prior experience with VR and higher self-efficacy in the pre-test would decrease extraneous cognitive load. The corresponding regression model showed poor fit, $F(2, 42) = 1.22$, $p = .305$, Multiple $R^2 = .055$, and Adjusted $R^2 = .01$. Neither VR experience ($t = -0.87$, $p = .390$) nor self-efficacy ($t = -1.28$, $p = .208$) seemed to have an effect on extraneous cognitive load. Hypothesis 3 must therefore be rejected.

Hypothesis 4 assumed that empathy positively affects perspective-taking. Regression analysis showed that there was no significant effect, $F(1, 43) = 0.68$, $p = .415$, meaning that hypothesis 4 must be rejected.

Hypothesis 5a stated that presence and realism negatively affect extraneous cognitive load. Regression analysis ($F(2, 42) = 6.42$, $p = .004$, Multiple $R^2 = .234$, Adjusted $R^2 = .198$) showed that this was true for realism ($t = -2.03$, $p = .048$, estimate = -0.64), but not presence ($t = -1.28$, $p = .209$, estimate = -0.25). Hypothesis 5a is only partially corroborated by these findings.

Hypothesis 5b assumed a moderating influence of prior VR experience on the effect of hypothesis 5a. Moderator analysis revealed that the model explained variance, $F(5, 39) = 2.56$, $p = .043$, Multiple $R^2 = .247$, and Adjusted $R^2 = .150$, but showed no moderation effect. Neither the moderation of presence ($t = 0.22$, $p = .826$) nor of realism ($t = -0.55$, $p = .585$) reached statistical significance. Therefore, hypothesis 5b must be rejected.

5 DISCUSSION

This study explored the educational potential of VR for counseling training in higher education. To structure the interpretation of the findings, the following discussion is organized into six thematic sections. First, we explain the results found regarding the hypotheses. Second, we consider the unique potential of VR to supplement traditional counseling exercises in higher education contexts, particularly in light of limited institutional resources. Third, we reflect on the methodological and conceptual limitations of the present study. Fourth, we discuss the prospective role of VR scenarios for repeated and adaptive training, addressing the scalability and personalization of learning opportunities. Fifth, we broaden the implications of our findings by situating them within related disciplines such as psychology, social work, and teacher education. Finally, we draw overall conclusions and outline avenues for future research.

5.1 Interpretation of hypotheses and findings

In this study, we tested several hypotheses related to the potential impact of VR on counseling competence, self-efficacy, and other related variables. Although we observed some trends, the results were often not statistically significant, necessitating a closer look at the theoretical implications considering existing literature.

Hypothesis 1 posited that counseling competence and self-efficacy would increase from pre- to posttest. Our results revealed only a small, statistically non-significant increase in both self-efficacy and counseling competence. These findings align with previous studies that suggest VR interventions, while promising, may not always lead to large, immediate gains in skills, particularly in one-session designs [12], [44], [57]. These studies highlight that the effectiveness of VR in fostering self-efficacy may require longer-term engagement or additional elements such as personalized feedback, pedagogically sound implementation into the class curriculum, or post-simulation debriefings [23], [59], [63], [88].

Hypothesis 2 examined the impact of presence and realism on perspective-taking, counseling competence, and self-efficacy, while also exploring the negative effects of extraneous cognitive load. Regression analyses showed that both presence and extraneous cognitive load influenced perspective-taking, whereas realism was a significant predictor of counseling competence, which supports findings from earlier studies emphasizing the importance of realism in VR-based training [48], [49], [53]. However, the minimal effect of realism on self-efficacy corroborates mixed findings in the literature regarding the strength of realism in influencing this outcome [9]. Extraneous cognitive load, on the other hand, showed a strong negative effect on perspective-taking, suggesting that the cognitive burden of VR environments can impair skill acquisition, a concern voiced by earlier research [55], [56]. Thus, hypothesis 2 is partially supported, with the identified relationships between presence, realism, and cognitive load echoing well-established findings in the VR literature [12], [40].

Hypothesis 3 predicted that prior VR experience and self-efficacy would negatively influence extraneous cognitive load. However, the regression model revealed no significant effects, indicating that neither prior VR experience nor self-efficacy had a substantial impact on cognitive load. This finding contradicts previous studies that suggested prior VR experience can reduce cognitive load through familiarity with the technology [12]. The lack of significant findings may reflect the novelty of VR for the participants, considering the majority of the present sample had little to no experience with VR. This may also indicate that more extended exposure is needed to see such effects.

Hypothesis 4 suggested that empathy would positively influence perspective-taking. However, no significant effect was found. This result contrasts with research that links empathy to better perspective-taking abilities, especially in therapeutic contexts [40], [44]. It may be that VR training environments, in contrast to live interactions, do not elicit empathetic responses in the same way, or that the empathy measure used in this study was insufficiently sensitive [1].

Hypothesis 5 proposed that presence and realism would decrease cognitive load and that this effect would be moderated by prior experience with VR. Our results only partially supported this hypothesis, with realism negatively impacting cognitive load, while presence did not. This finding resonates with previous research that highlights realism as a crucial factor in reducing cognitive load in VR settings [12], [88]. The null effect of presence calls for further investigation, as some studies have shown

that presence is a key determinant of learning outcomes in VR environments [49], [89], while others were also unable to find such a relation [46]. As per moderation, no significant effect was found. This does not align with research that suggests a link of prior experience with VR technology and learning outcomes [90], [91]. The role that presence and realism play for novices regarding cognitive load might be more complex than the present research design was able to cover, and further research into this area is needed [92]. Skulmowski and Xu [56] point out that, for beginners, both presence and realism may have a similar impact on cognitive load regardless of prior experience with VR.

5.2 The potential of VR for counseling training in higher education

As highlighted in the introduction, higher education seminars focused on developing social skills such as counseling competence frequently face constraints due to limited institutional resources such as time, space, and available supervision. Our findings support the idea that VR enables effective perspective-taking, which has been identified as a core mechanism in developing social competence [40], [93]. Participants in our study reported high levels of presence and realism, with realism emerging as a significant positive predictor of counseling competence. This suggests that well-designed virtual environments can foster not only engagement but also skill acquisition, particularly when they allow students to suspend disbelief and interact with virtual clients as if they were real. The level of perceived realism thus becomes a key factor in supporting effective learning processes, as it promotes immersion, emotional involvement, and the transfer of acquired skills to real counseling situations [12], [48], [94]. In this sense, realism may function as a central lever for facilitating meaningful skill development in virtual environments.

Moreover, the asynchronous and scalable nature of VR offers an attractive solution for institutions where time and space are limited. In many counseling-related seminars, students only engage in a handful of live practice opportunities, often with peers in artificial settings. By contrast, VR enables repeated exposure to standardized scenarios without placing additional demands on teaching staff. This aligns with prior research emphasizing the potential of immersive learning to democratize access to complex skills training [88], [89], [95].

At the same time, established counseling training approaches such as supervised role-play, peer counseling, or simulated counseling sessions with professional feedback already provide valuable opportunities for experiential learning and reflective practice [96], [97]. Role-play formats are widely used in counselor education because they allow students to practice communication skills, receive individualized feedback, and develop interpersonal sensitivity in authentic interaction settings. These approaches are pedagogically valuable, particularly when combined with professional supervision and structured reflection. However, they are also resource-intensive and difficult to scale in higher education contexts characterized by limited staff capacities, restricted seminar time, and large student cohorts. In comparison, VR-based counseling training may offer a more standardized and repeatable learning environment that enables students to practice counseling situations more frequently and with reduced social pressure. Nevertheless, VR cannot fully replicate the complexity, spontaneity, and emotional nuance of real human interaction or replace the individualized feedback processes provided through professional supervision. Rather than serving as a substitute for established training formats, VR may therefore be best understood as a complementary instructional tool that extends

opportunities for practice, reflection, and preparation for real-world counseling situations.

Taken together, the findings indicate that VR may represent a promising and scalable supplement to traditional counseling education, particularly in contexts where opportunities for repeated practice and individualized supervision are limited. By combining high-fidelity environments with guided interaction, VR may be enabling a quality of experiential learning that is rarely achievable in conventional university settings. The potential added value of VR might become particularly apparent when it is embedded within a broader instructional design that integrates theoretical instruction, conventional role-play, and real-world practicum experiences. In such a configuration, VR-based training could serve both as a preparatory scaffold for practice-based learning and as a reflective space for post-experiential consolidation, potentially contributing to more coherent and effective professional training pathways.

5.3 Limitations and methodological considerations

While the present study offers valuable insights into the potential of VR for counseling training, several methodological limitations must be considered when interpreting the results.

First, the study employed a one-group pretest-posttest design without a control condition. This limits causal interpretations and raises the possibility that observed changes in counseling competence and self-efficacy may have been influenced by external factors such as general seminar content. Future research should employ randomized controlled trial designs to isolate the specific contribution of VR-based training.

Second, the sample size was relatively small, predominantly female, and the participants were drawn from a single university program, potentially limiting the generalizability of findings. Although internal consistency of most measures was acceptable, the reliability of the empathy scale was notably low, which may have contributed to the non-significant findings regarding hypothesis 4.

Third, while prior experience with VR was included as a moderator, its usefulness in the current dataset was limited. The distribution of this variable was heavily skewed to the lower part of the scale, with most participants reporting little to no prior exposure to VR. As a result, the chance to observe moderating effects depending on experience was low. This raises the question of whether effects such as extraneous cognitive load might differ in more experienced user groups, as suggested by previous research [12], [56]. Future studies should either ensure more balanced samples or treat prior experience as a grouping variable with targeted comparisons. Another option would be to give students time to familiarize themselves with VR technology and the possible interactions (e.g., teleportation) before the virtual consultation.

5.4 Enhancing VR-based learning through repetition and personalization

Most university seminars do not present learners with many opportunities to actively apply social skills, such as counseling techniques. VR directly addresses this educational gap by providing immersive opportunities for active skill application. VR-based learning environments may now enable practicing different training

scenarios or revisiting the same scenario multiple times, potentially with automated feedback. Although the present study implemented a single-session design, the pedagogical promise of VR extends far beyond isolated experiences. With the ongoing integration of artificial intelligence (AI), future applications could offer dynamic, adaptive feedback and conversational branching based on learners' behavior and verbal input. This would enable counseling training to evolve into a personalized learning journey, where scenarios adapt to the learner's proficiency level, communication style, and emotional attunement. Personalized, iterative exposure could foster steeper learning curves and increase self-efficacy over time [94], [98], [99]. Moreover, integrating VR more systematically into counseling curricula rather than treating it as a one-off intervention would allow for the development of longitudinal skill trajectories, closely aligned with real-world professional requirements [59], [100].

Beyond adaptivity, AI also holds the potential to fundamentally transform how virtual clients are implemented. Whereas our study relied on trained student assistants to portray the client in real time, future VR-based training systems could use AI-driven avatars that are pre-programmed or dynamically prompted with detailed case information [63], [101], [102]. Such avatars could simulate a wide variety of client types and issues, without requiring human facilitation, making the delivery of counseling training highly scalable and logistically efficient. This would allow institutions to offer consistent training experiences across cohorts and settings, and even outside traditional classroom environments [35], [103].

However, while AI-generated clients promise high scalability and flexibility, questions remain regarding the authenticity of such interactions. Previous research [64], [66], [104] suggests that conversations with AI-driven avatars can sometimes feel overly enthusiastic or emotionally imbalanced, potentially undermining the realism and unpredictability that characterize real counseling encounters. As a result, future development should strike a careful balance between standardization and realism, perhaps by blending scripted AI behavior with human oversight or hybrid interaction models.

Overall, repeated and adaptive training in VR, especially when guided by AI, represents a significant step forward in modern counseling education. It allows learners to practice with consistency and depth that is rarely feasible in traditional settings, and it opens the door for more inclusive and equitable access to complex interpersonal training.

5.5 Implications for broader application fields

While this study focused on counseling training in education science programs, the findings have broader implications for other disciplines in which social, emotional, and conversational skills are central to professional practice. Fields such as psychology, social work, medicine, and teacher education all rely heavily on practitioners' interpersonal sensitivity and conversational competence. For example, mental health professionals must learn to build rapport and recognize subtle emotional cues, while social workers often navigate complex client interactions in high-stakes situations. Similarly, teachers benefit from training in verbal feedback, conflict mediation, and culturally sensitive communication [28], [105]. These are domains where practical experience is essential but often difficult to provide in safe, controlled environments and therefore limited in higher education settings. VR may be able to fill this gap by offering repeatable, scalable, and realistic training experiences without placing clients or students at risk.

Moreover, as higher education institutions increasingly move toward blended and digitally enriched curricula, VR offers a promising means to anchor affective and experiential learning within otherwise theory-heavy programs. This aligns with current calls to integrate competence-oriented learning with immersive, reflective, and interactive formats [88], [106], [107]. The potential to incorporate VR into entire learning pathways, for example, as part of professional degree programs or certificate-based skill trainings, could transform the way social skills are taught, assessed, and accredited.

In this light, the present study contributes to a growing body of evidence showing that the capabilities of immersive technologies go beyond engagement. They can serve as efficient platforms for both cognitive and affective learning in complex interpersonal domains. Future research should explore cross-disciplinary implementations and examine how different professional cultures interact with VR-based learning to maximize its relevance and impact.

5.6 Conclusion

Our study demonstrates the potential of VR as an effective tool for counseling training in higher education. Even if improvements in self-efficacy and counseling competence were modest, the findings emphasize VR's ability to foster such skills that are otherwise trained too infrequently and in not appropriately authentic manners. VR's scalability and ability to offer repeated, individualized practice make it a valuable supplement to traditional methods, particularly in resource-limited settings.

Although the study's limitations, such as the small sample size and lack of control group, call for further research, the potential of AI-enhanced VR for adaptive and personalized training is visible. As VR and AI technologies advance, they could significantly enhance training in counseling and other interpersonal professions, offering more accessible and effective learning opportunities.

6 DECLARATIONS

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6.2 Consent to participate

Written informed consent was obtained from all individuals. Participation could be withdrawn at any time without any negative consequences.

6.3 Consent to publish

Participants agreed on the informed consent sheet to have their research data published.

6.4 Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding authors on reasonable request.

6.5 Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT 4 in order to translate notes from German to English. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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8 AUTHORS

Kristian Träg is with the University of Duisburg-Essen, Essen, Germany (E-mail: kristian.traeg@uni-due.de).

Miriam Mulders is with the University of Duisburg-Essen, Essen, Germany (E-mail: miriam.mulders@uni-due.de).

Dominik Evangelou is with the University of Duisburg-Essen, Essen, Germany (E-mail: dominik.evangelou@uni-due.de).