Effects on mentalization through educational intervention using Virtual Reality

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Abstract

Mentalization as "the mental process by which an individual implicitly and explicitly interprets the actions of self and others as meaningful on the basis of intentional mental states such as personal wants, needs, feelings, beliefs, and reasons. Soft skills refer to a set of positive personal attributes and competences that improve relationships, work performance and market value. Social skills such as communication and cognition become part of soft skills when it comes to negotiation skills and the ability to interact positively with each other. The latter also refer to a set of skills that determine how we interact with others; this depends on the quality of mentalization processes. Virtual reality, also known as computer-simulated reality or video-generated environments, is a computer technology that simulates imaginary or real environments such as classrooms. The power of this technique lies in the rapid construction of various realistic training and stimulus control environments. Several studies have demonstrated the efficiency of simulation using VR for knowledge acquisition but there is a lack of studies focused on mentalization and soft skills involvement. The aim of this study is to clarify the relationship between using VR and the improvement of mentalization through activities involving soft skills.

Keywords

Virtual Reality; soft skills; training; intervention; educational; mentalization.

1. Introduction

Mentalization as "the mental process by which an individual implicitly and explicitly interprets the actions of self and others as meaningful on the basis of intentional mental states such as personal wants, needs, feelings, beliefs, and reasons [1]. Authors define “Hypo-mentalization” as the inability to consider complex models of mental states, resulting in an impaired ability to understand others and the self [1].

Soft skills refer to a set of positive personal attributes and competences that improve relationships, work performance and market value [2]. Soft skills play a very important role in the workplace, job position as well as in the success of your career. These skills are applicable to each field of work and they are usually individual behavioral traits [3,4]. Several studies state that a combination of personal qualities and soft skills will certainly contribute to improving the employability of graduates [5,6], especially soft skills which are broadly applicable [3]. The latter also refers to a set of abilities that determine how we interact with others [1]. ‘Soft skills represent a dynamic combination of cognitive and meta-cognitive skills, interpersonal, intellectual and practical skills. Soft skills help people to adapt and behave positively so that they can deal effectively with the challenges of their professional and everyday life.’ In this instance, soft skills relate to a vast range of interpersonal and social qualities and competences, transferable across economic sectors and industries [7,8]. It's believed that students need to develop specific skills in order to adjust to the culture of their schools. This is because researchers claim that these traits help students better adapt to the school’s atmosphere and help them become more proactive. [9]. Additionally, emotional intelligence studies support the theory that students need to be

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clever at communicating with others. This is because it's believed that these skills will predict positive careers and lead to more teamwork in an era of rapid globalization. It's also believed that these skills are necessary for effective cross-cultural communication and retaining talent in organizations [10,11,12]. Several pieces of European Commission paperwork [13,14,15] and many HR specialists [16] stated that young graduates' 'soft skills' are very important to their employability. These skills include the ability to work well with others, communicate clearly skills (such as the ability to work in teams, to communicate clearly and effectively, to adapt to different cultural contexts, to solve problems, to manage conflicts, to show endurance in complicated or stressful situations, etc.), adapt to new cultures and solve problems (i.e. the capacity to deal with a problem in a creative way). Social skills such as communication and cognition become part of soft skills when it comes to negotiation skills and the ability to interact positively with each other [17]. The latter also refer to a set of skills that determine how we interact with others [18]; this depends on the quality of mentalization processes.

We decided to clarify whether an intervention based on these skills would improve mentalization skills by using a virtual environment that allow a rapid construction of various life-like situations and a specific stimulus control. There are many studies in literature about using Virtual Reality in the rehabilitation of many disorders, but few studies focus on the use of VR in the development of soft skills and improvement of mentalization ability.

Virtual reality, also known as computer-simulated reality or video-generated environments, is a computer technology that simulates imaginary or real environments such as classrooms [19, 20].

Immersive VR, Tabletop VR, Projected VR and CAVE (C - Automated Virtual Environment) are the most commonly used types of VR. The power of this technique lies in the rapid construction of various realistic training and stimulus control environments [21-24]. The development of VR systems provides many advantages, such as create an environment that meets the needs of students, provides stability between users and stimuli, and fully records students' behaviors and functions, enables rapid feedback, saves time and money, and provides more interesting tools to motivate them to use this technique [21,22]. In the rehabilitation field, VR technologies enable people with impairments and disabilities due to brain damage to experience everything that is difficult or impossible for them in reality [24,27], however, it may be used as a educational tool to allow students to experience life-like events.

Several studies have demonstrated the efficiency of simulation using VR for knowledge acquisition and for technical [27,28] and nontechnical [29,30] skills. Among the studies, the most frequently investigated soft skill is teamwork [31,32,33,40,38]; then, there is communication [31,34,37,40] followed by situation awareness, [31,37,38] decision-making [31, 35, 40] leadership [41, 44] and stress management [44, 45]. We referred to these skills mostly.

Virtual reality may be an innovative tool that may improve the educational system because of its efficiency and the capacity of data generation: VR simulators can track and record every action. The data are used to give learners feedback on their performance and progress over time through their profile, allowing them to verify their skills acquisition and become proactive in their learning.

The aim of this study is to clarify the relationship between using VR and the improvement of mentalization through activities involving soft skills.

2. Material and methods

2.1 Participants

In this study, we considered 40 subjects aged between 15 and 16. All the subjects had been recruited from the same city (Caserta, Italy) belonging to the same high school (scientific address) and they were homogeneous in terms of the socio-cultural background of the parents. Therefore, the inclusion criteria were as follows: (a) a IQ between 95-105 through the WISC-IV [46,47] (b) absence of other psychiatric illness assessed by K-SADS [48] (c) medium-high socio-cultural class assessed through the SES scale [49].

After confirming the inclusion criteria of the sample, the subjects did not have different sociocultural factors. The sample was divided into two groups, 20 subjects each group.

In order to assess mentalization skills, The Reflective Functioning Questionnaire was assessed in two times: the first time (T0) after 4 months since the beginning of the school, and the second time (T1) at the end. The interventions lasted 5 months.

The data were collected at the FINDS Neuropsychiatry Outpatient Clinic by licensed psychologists in collaboration with the University of International Studies of Rome (UNINT).

2.2 Instruments

The protocol used consists of the following tests:

SES: Self-administered questionnaire that allows collecting information about the level of education and professional of parents and indicates the position of the person or family within the social system [49];

WISC-IV: the IQ has been evaluated through the administration of Wechsler scales [46], multicomponent intelligence scales that allow to synthesize the intellectual ability of a subject through a global IQ index, the Verbal Comprehension Index (ICV, verbal reasoning ability on the basis of previously learned information), the Visuo-Perceptive Reasoning Index (IRP), the Index of Working Memory (IML, ability to maintain information and use it within seconds) and the Processing Speed Index (IVE, ability to process information efficiently).

YRFQ – 8: to provide an easy to administer self-report measure of mentalizing. It is composed of 8 item on the ability to infer mental states [50];

K-SADS: a diagnostic interview for the evaluation of psychopathological disorders (past and present) in children and adolescents aged 6 to 17 years according to the criteria of DSM-5. It consists of: an introductory unstructured interview, a diagnostic screening interview, a checklist for the administration of diagnostic supplements, five diagnostic supplements (mood disorders, psychotic disorders, anxiety disorders, attention deficit disorders and disruptive behavior, substance abuse) for each of which the criteria required by the DSM are provided, a comprehensive checklist of the patient's clinical history and a scale for the overall assessment of the current functioning of the child (VGF) [48].

2.3 Procedures

We administered the Y-RFQ 8 after 4 months from the beginning of school. After that we provided two types of interventions: in the experimental group it was used the Virtual Reality, while in the control group it was administered the intervention without using it. It was composed of a training course (frontal lessons and laboratory activities) organized by the University of International Studies of Rome (UNINT). It is structured as follows: an overall of 15 hours divided into 5 modules (3 hours each). Three theoretical modules that provide lectures with final debate among students. The first one was a theoretical lesson on the emotional regulation and affective development; the second one was on the awareness of themselves and the other one focusing on know our and the others' mind; the third one was on our relationships and the differences between each other. Moreover, the practical modules were respectively on the exploration of our emotions and telling our life history to the class as an instrument of self and the other-knowledge. In the Virtual Reality sessions they had to view a video on the topics above mentioned. After that the played with a game in which they should interact actively in specific life-like situations. The intervention lasted 5 months. Finally, we assessed Y-RFQ 8 and we measured the mentalization skills after the intervention.

3. Results

Data analysis was conducted using SPSS 26.0 (2019) statistical data collection software. Significance at the 1% level ($\alpha < 0.001$) was accepted. We compared the two groups (variable between =Gr1, group with VR and Gr2, group without VR) with T0 and T1 (variable within - time) to see if there was any normalization in the two subscales of Y-RFQ8 after the educational intervention. We want to check if there is an improvement between T0 and T1, but also between the two groups because one group used VR. Therefore, we performed ANOVA 2x2 mixed with repeated measurements: within (time) and between (group) factor.

This analysis showed the following results:

Interaction time*group is significant [F (1,39) = 2.98, p<0.001]. This data indicates that there is a significant interaction between time and the group. More specifically, between the pre and post educational intervention and between groups there is a significant normalization of both subscales, more significant in Gr1 that had carried out a training through VR (table 1, table 2, figure 1, figure 2).

Table 1
Interaction time*Group Certain Scale Y-RFQ8

Time	Group	Means	SD	F	P
0	1	13.53	1.67		
	2	13.48	1.52		
1	1	10.61	1.29		
	2	11.92	1.21	2.98	<0.000*

**Statistical significance.*

Table 2
Interaction time*Group Uncertain scale Y-RFQ8

Time	Group	Means	SD	F	P
0	1	7.56	1.50		
	2	7.63	1.61		
1	1	9.68	1.32		
	2	8.22	1.33	1.97	<0.000*

**Statistical significance.*

Interaction scale*time is significant [F (1.39) = 53,79, p<0.001]. This data indicates that there is a significant interaction between the two subscales and time.

More specifically, there is a significant improvement in mentalization skills after the intervention; at T0 the RFQ_U was low while the RFQ_C was high, while at T1 both tend to normalize (table 3).

Table 3
Effects of time in both subscales Y-RFQ8

Time	Scale	Means	SD	F	P
0	RFQ_C	9.125	1.91		
	RFQ_U	7.575	0.63		
1	RFQ_C	8.413	0.49		
	RFQ_U	9.425	0.49	53.79	<0.000*

**Statistical significance.*

Interaction scale*group is significant [F (1.39) = 52,58, p<0.001]. This data indicates that there is a significant interaction between the two subscales and groups.

More specifically, there is a significant improvement in mentalization skills after the intervention in both groups; the RFQ_U was lower in the Gr1 than Gr2, while the RFQ_C was higher in the Gr1 than Gr2 (table 4).

Table 4
Effects of groups in both subscales Y-RFQ8

Group	Scale	Means	SD	F	P
1	RFQ_C	9.215	1.73		
	RFQ_U	7.467	0.54		
2	RFQ_C	8.374	0.51		
	RFQ_U	9.382	0.48	52.58	<0.000*

**Statistical significance.*

Figure 1
Interaction time*Group Certain Scale Y-RFQ8

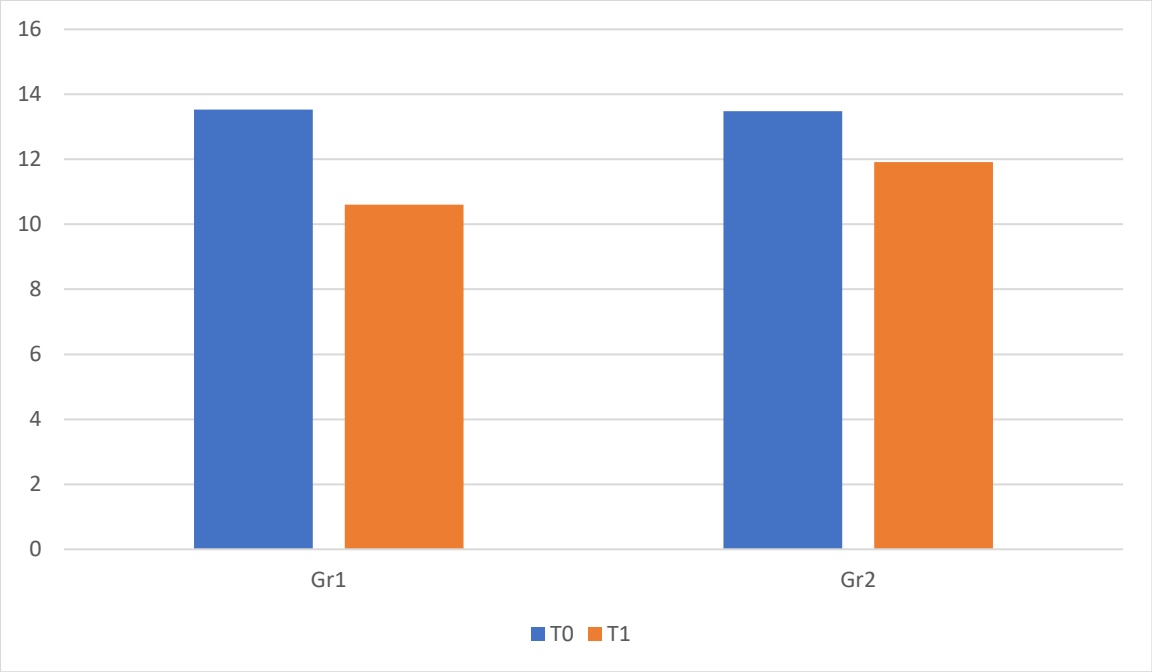
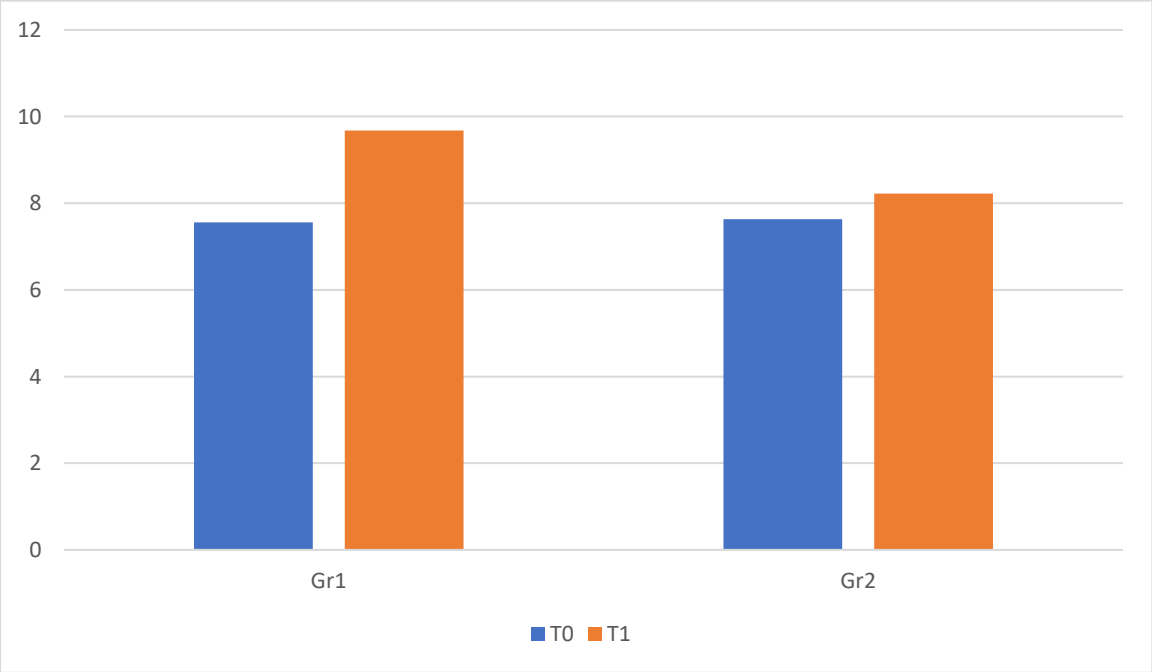


Figure 2
Interaction time*Group Uncertain Scale Y-RFQ8



4. Discussion

Learning has an 'affective component', described as one of four key criteria for simulation-based learning, which aligns with learners' needs, with motivation and self-efficacy being key concepts [51]. Also, note that many VR simulators enable participants to repeat their sessions, which helps them recognize and analyze their interactions and emotions [52]. Trainees emphasized and valued the emotional impact of VR simulations on self-efficacy,[53] as did the opportunities they provided to communicate with other disciplines or experience some scenarios of human interaction in problematic settings prior to any clinical practice [54]. In terms of motivation, VR simulations seem to be of particular interest, as it has been described as a very valuable learning experience, [55] superior to traditional taught lectures, [56] and seen as excellent preparation for clinical situations [57].

Another interest in VR simulation is data generation, since VR simulators track and record every movement. This data is used to provide learners with feedback on their performance and progress through their profiles, allowing them to review their skill acquisition and be proactive about their learning. However, they can also help educators better understand student learning processes by allowing them to customize inputs and complement their traditional teaching methods with appropriate simulations [58].

The most commonly studied soft skills are interpersonal and social skills, such as teamwork and communication. As a cognitive ability, it is also known as mentalizing ability. In fact, it's a vital personal skill, especially in a dynamic environment. Virtual reality can be used to render these environments very realistically.

In our research, where we tried to do this through virtual reality, we found that mentalizing skills tended to normalize in the experimental group. The control group showed improvements in mentalizing skills, but less than the experimental group.

These results suggest that VR may be involved in these processes due to its ability to reproduce more realistic and dynamic environments for student interaction and learning.

In conclusion, virtual reality simulation system is the latest development in education. The use of VR simulators for technical skills training has increased, but non-technical skills are less used than soft skills (i.e., cognitive and interprofessional social skills).

Evaluation of VR systems as training tools is essential, but little systematic research has been done so far. Most studies assessed the usability and acceptability of VR simulations, and few studies measured the impact of VR simulations on soft skills and mentalization development.

Nevertheless, the development of VR technologies and the portability of VR systems offer a very promising outlook for the future training. The wide range of possible scenarios that can be simulated, especially for soft skills training, will undoubtedly contribute to the progress of educational system.

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