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Validation of a Virtual Environment (VE) for Learning Vocal Skills

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Virtual reality (VR)



“VR is a scientific and technical domain that uses **computer sciences** and **behavioral interfaces** to simulate **in a virtual world** the behavior of 3D entities, which **interact in real time** with each other and with one or more users in a **pseudo-natural immersion** via sensorimotor channels”



Applications of VR in healthcare

- ▶ Training and education of professionals



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Applications of VR in healthcare

- ▶ Diagnosis
 - ▶ Treatment
 - ▶ Prevention
- (Education of patients)



Biofeedback integrated in VR
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Validation of a virtual environment: Scientific approach

- I. Elicitation of the expected behavior
- II. Immersion and presence in VR
- III. Potential side effects
- IV. Benefits of new technology over other existing methods




Virtual classroom



<http://hdl.handle.net/2268/222818>

Virtual classroom



Salle de Classe 

Mélangeur de volume

Coix de récréation 0.25

Son du corridor 0.25


Sons de la Classes 0.25

Facteur d'agitation des élèves (0-100) 30

Augmente la chance qu'une animation de distraction se produise (Ex: Salle de classe attentive avec un peu d'animations = 5)

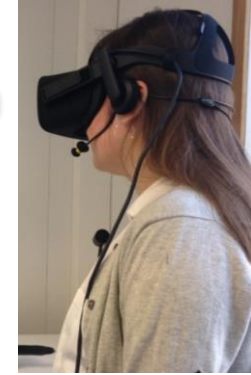
FPS: 38 (26,0 ms)

<http://hdl.handle.net/2268/222818>

Cet environnement a été conçu pour être utilisé en position debout 



Virtual classroom



Visual display through the Oculus Rift (for user)

<http://hdl.handle.net/2268/222818>

Applications

- ▶ Speech therapy
- ▶ Pedagogy

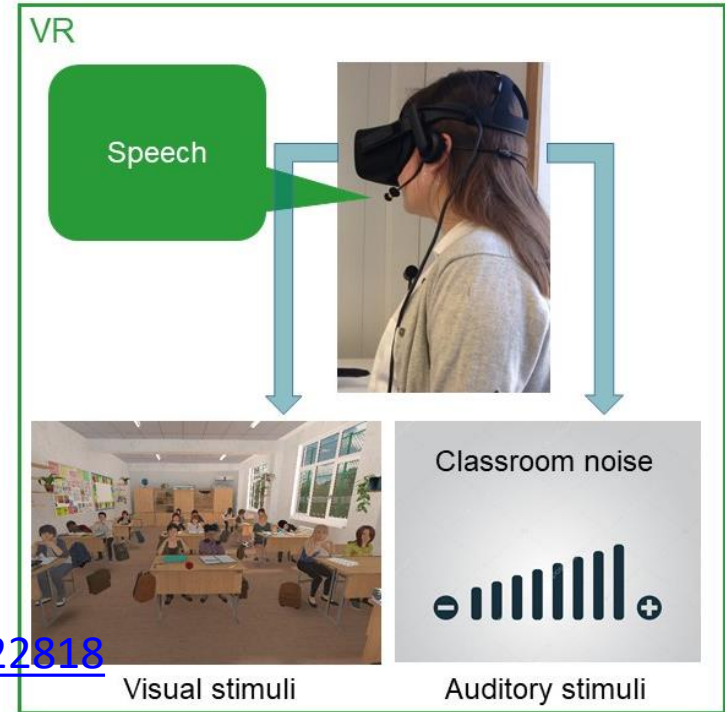
Validation of a virtual classroom:

I. Elicitation of the expected behavior



Methods

30 teachers
Same lesson
Acoustic
measures



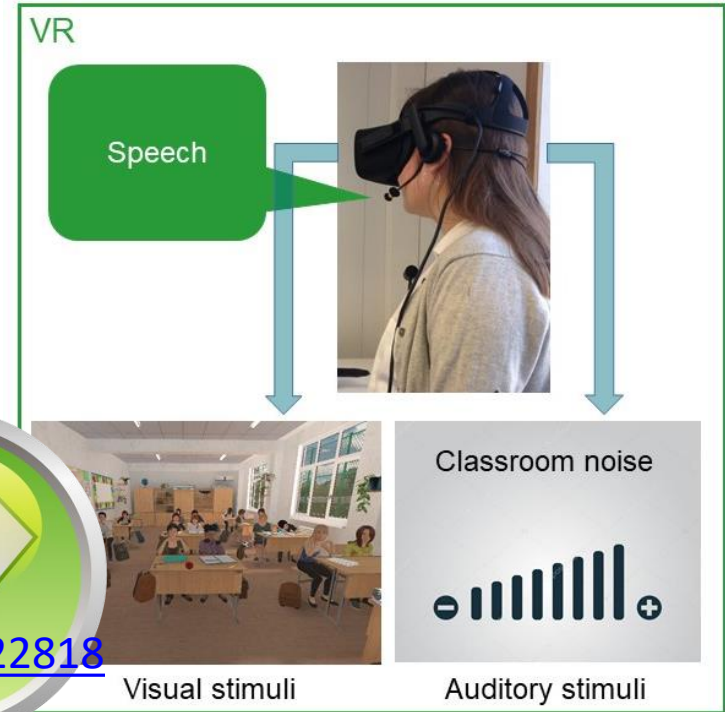
Validation of a virtual classroom:

I. Elicitation of the expected behavior



Results

Similar
voice use



Validation of a virtual classroom:

II. Immersion and presence in VR



Immersion

- ▶ Related to the quantity and quality of sensory data from the environment
- ▶ Product of the technology that facilitates the production of the multimodal sensory « input » to the user

(Burdea et al., 1996 ; Wiederhold & Bouchard, 2014)



IMMERSIVE TENDENCIES QUESTIONNAIRE (Witmer & Singer, Version 3.01, September 1996)* Revised by the UQO Cyberpsychology Lab (2004)

Indicate your preferred answer by marking an "X" in the appropriate box of the seven point scale. Please consider the entire scale when making your responses, as the intermediate levels may apply. For example, if your response is once or twice, the second box from the left should be marked. If your response is many times but not extremely often, then the sixth (or second box from the right) should be marked.

1. Do you easily become deeply involved in movies or tv dramas?

NEVER | | | OCCASIONALLY | | | OFTEN

2. Do you ever become so involved in a television program or book that people have problems getting your attention?

NEVER | | | OCCASIONALLY | | | OFTEN

3. How mentally alert do you feel at the present time?

NOT ALERT | | | MODERATELY | | | FULLY ALERT

4. Do you ever become so involved in a movie that you are not aware of things happening around you?

NEVER | | | OCCASIONALLY | | | OFTEN

5. How frequently do you find yourself closely identifying with the characters in a story?

NEVER | | | OCCASIONALLY | | | OFTEN

6. Do you ever become so involved in a video game that it is as if you are inside the game rather than moving a joystick and watching the screen?

NEVER | | | OCCASIONALLY | | | OFTEN

Validation of a virtual classroom:

II. Immersion and presence in VR



Presence

- ▶ State of consciousness
- ▶ Experience of being or acting in one place, when physically situated in another place

(Slater et al., 1996; Wiederhold & Bouchard, 2014; Witmer & Singer, 1998)



PRESENCE QUESTIONNAIRE

(Witmer & Singer, Vs. 3.0, Nov. 1994)*
Revised by the DQOC/psychology Lab (2004)

Characterize your experience in the environment, by marking an "X" in the appropriate box of the 7-point scale, in accordance with the question content and descriptive labels. Please consider the entire scale when making your responses, as the intermediate levels may apply. Answer the questions independently in the order that they appear. Do not skip questions or return to a previous question to change your answer.

WITH REGARD TO THE EXPERIENCED ENVIRONMENT

1. How much were you able to control events?

NOT AT ALL | SOMEWHAT | COMPLETELY

2. How responsive was the environment to actions that you initiated (or performed)?

NOT RESPONSIVE | MODERATELY RESPONSIVE | COMPLETELY RESPONSIVE

3. How natural did your interactions with the environment seem?

EXTREMELY ARTIFICIAL | BORDERLINE | COMPLETELY NATURAL

4. How much did the visual aspects of the environment involve you?

NOT AT ALL | SOMEWHAT | COMPLETELY

5. How natural was the mechanism which controlled movement through the environment?

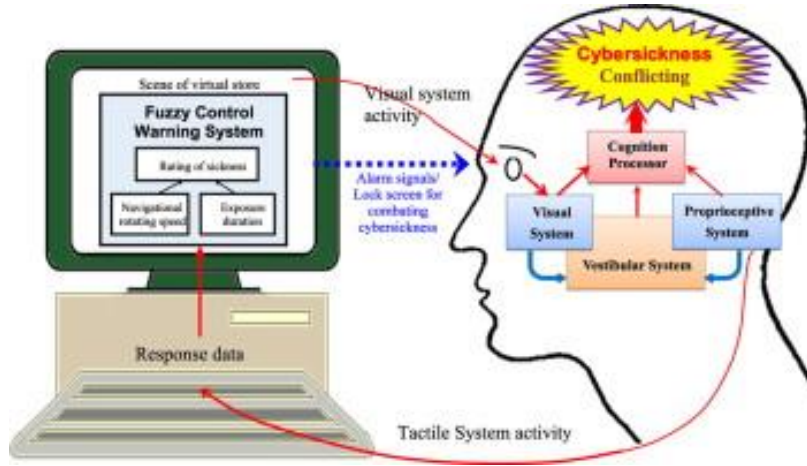
EXTREMELY ARTIFICIAL | BORDERLINE | COMPLETELY NATURAL

Validation of a virtual classroom:

III. Potential side effects



Cybersickness



(Cheng-Li Liu, 2014)

SIMULATOR SICKNESS QUESTIONNAIRE

Kennedy, Lane, Berbaum, & Lilienthal (1993)***

Instructions : Circle how much each symptom below is affecting you right now.

1. General discomfort	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
2. Fatigue	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
3. Headache	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
4. Eye strain	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
5. Difficulty focusing	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
6. Salivation increasing	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
7. Sweating	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
8. Nausea	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
9. Difficulty concentrating	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
« Dizziness of the Head »	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
« Motion Sickness »	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
« Eyes open »	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
« Eyes closed »	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
« Awareness »	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
	<u>None</u>	<u>Slight</u>	<u>Moderate</u>	<u>Severe</u>

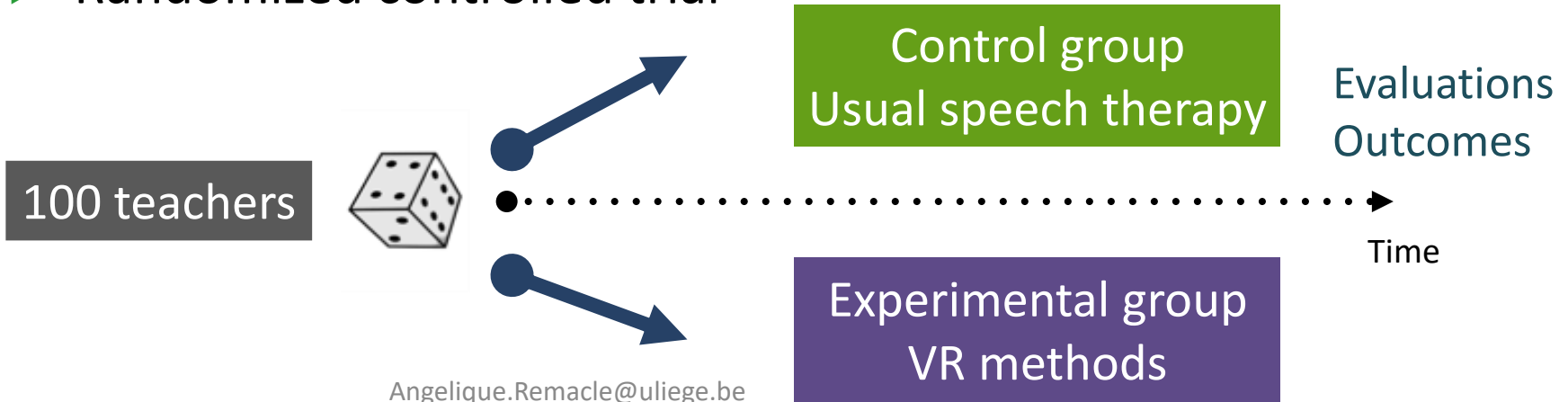


Validation of a virtual classroom:

IV. Benefits over other existing methods



- ▶ Research protocol
 - High level of evidence
 - Good degree of confidence
- ▶ Randomized controlled trial





Conclusion

- ▶ Scientific validation required
- ▶ VR elicits behaviors and emotions used by the clinician
- ▶ Need to train the clinician in VR therapy methods
- ▶ Not for every patient



Thank you

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