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► To cite this version:

Yasmina Kebir, Gaëlle Nicolas, Samuel Ferreira-Da-Silva, Pierre Chevrier, Jérôme Dinet, et al.. Using virtual reality to assess communication skills during a collaborative task with time pressure.. The First International Conference on Artificial Intelligence and Immersive Virtual Reality, Apr 2024, Venice, Italy. 10, pp.414 - 429, 2023, <10.55056/cte.568>. <hal-04845452>

HAL Id: hal-04845452

<https://hal.science/hal-04845452v1>

Submitted on 18 Dec 2024

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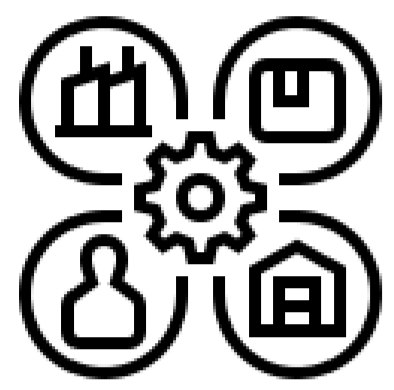
USING VIRTUAL REALITY TO ASSESS COMMUNICATIONAL SKILLS DURING A COLLABORATIVE TASK WITH TIME PRESSURE

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1 INTRODUCTION

Communication is an essential non-technical skill for any professional interaction [1].



Proven link between non-technical skills and accidents in high-risk jobs [2].

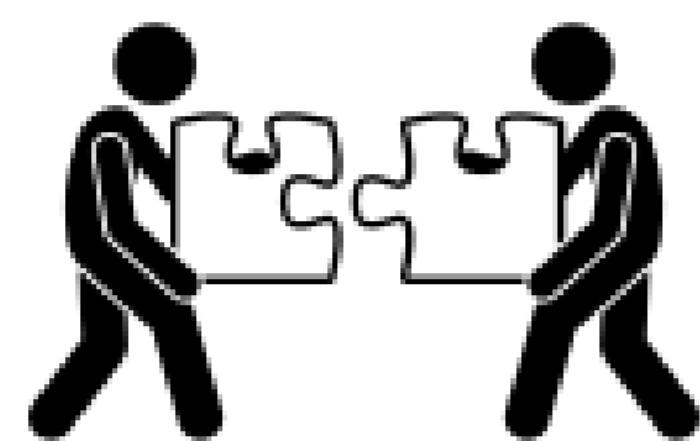
Virtual reality will be used as a means to assess communication skills in an unusual and challenging situation.



2 METHOD

THE VR SIMULATION : THE TASK

- A collective task resolution in a sub-marine environment.
- The team have to collaborate and communicate to succeed.



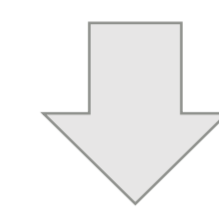
Task Objective

Assemble various pieces to produce a final item

- Comply with a set of rules
- Manage stress caused by various disruptive and stressful elements
- Deal with Time pressure

PARTICIPANTS

23 participants $\mu_{age}=22.5$ years; $\sigma_{age}=.97$ years
5th-year students from the same engineering school
Participants randomly divided into 4 groups



Quantitative and qualitative data collected through simulation
Per group and per participant

Intra-group + inter-group comparison

3 RESULTS

3.a QUANTITATIVE DATA



Performance indicators

- Time taken for the whole mission
- Number of errors
- Time taken for each subtask
- Number of errors per subtask

First subtask
 $\mu t = 07'48$
 μ erreurs = 9

Evolution of performance indicators

Last subtask
 $\mu t = 00'50$
 μ erreurs = 0

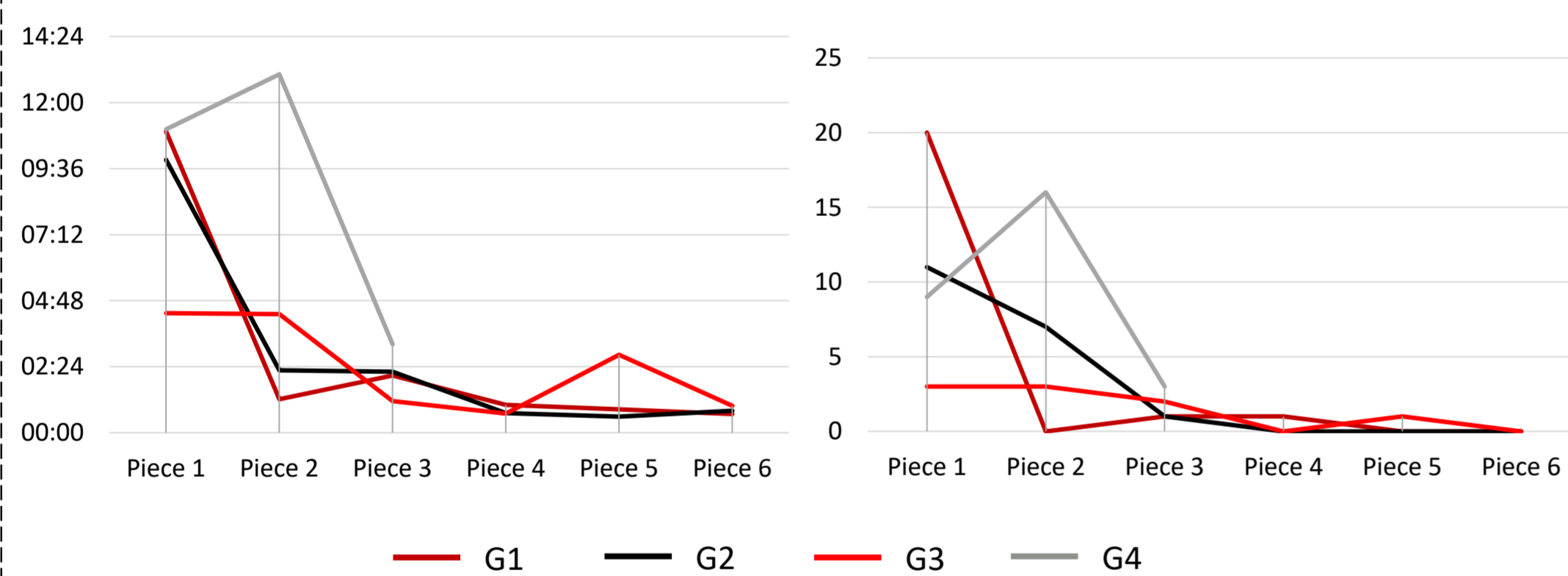


Figure1. time taken and errors number per piece and per group

Three types of group stand out

- G1 and G2 : performances \nearrow between piece 1 and piece 2, and \rightarrow after piece 3.
- G3 performance is \rightarrow with no significant variation in the production of the 6 pieces.
- G4 whose performance fluctuates unexpectedly $\nearrow \searrow$

Performance indicators at two levels:

- Time /errors
- Task progress level

G3 > G2 > G1 > G4

3.b QUALITATIVE DATA



- Number of participants interventions
- Number of commanders interventions
- Type of Verbal actions produced \Rightarrow Commander Vs operators
 \Rightarrow Piece 1 Vs piece 2 Vs 3, etc.
 \Rightarrow Group performance level

Natural language

Unstructured, negotiated meaning, interpretation, universal, complex, lengthy

Evolution of used language

Operative language

Structured, concise, restricted lexicon, monosomic, task-specific

- Overall, the number of interventions \searrow as the task progresses.
- For G4, the least efficient, the number of interventions \nearrow between the first and second part.

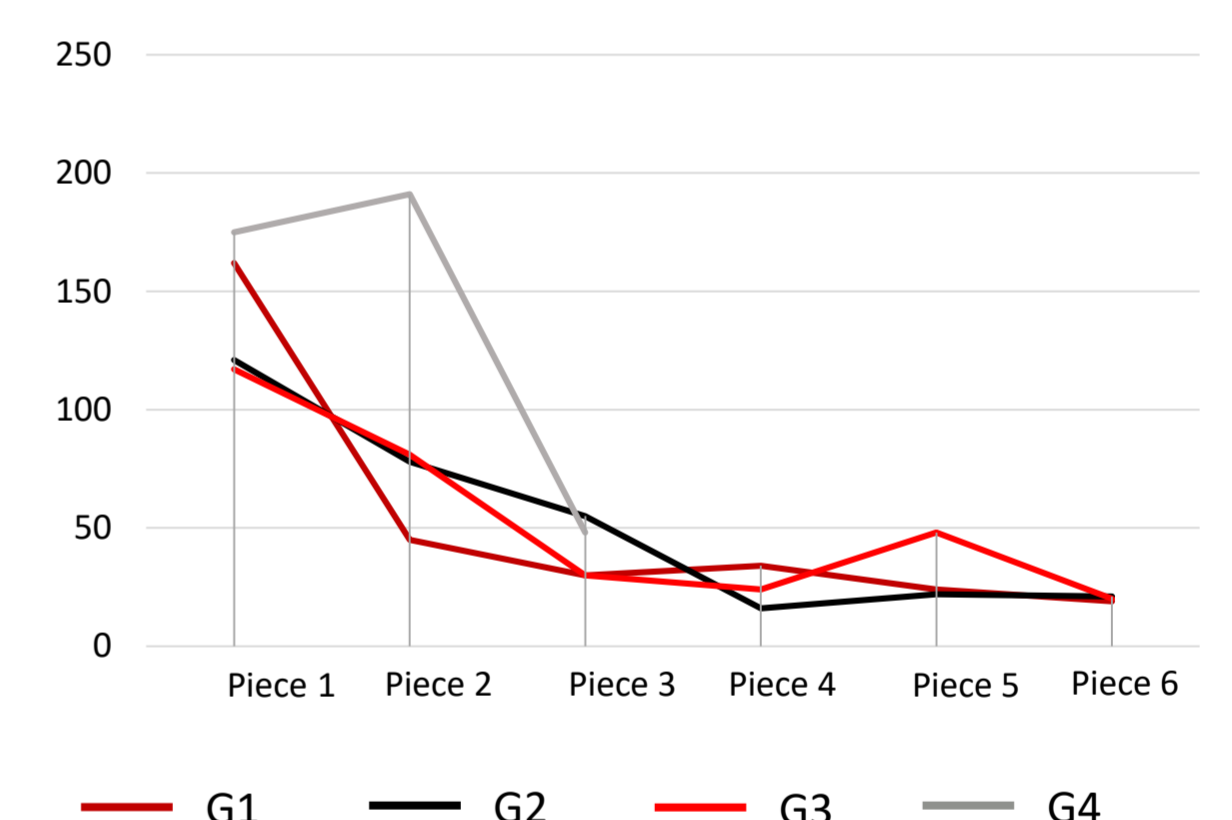


Figure2. Number of verbal interventions per group and per piece

Low perf.

- Increase in lengthy interventions.
- Lack of involvement.
- Humor during the task execution.
- Help is less given when asked.
- Same questions asked several times.

High perf.

- A progressive decrease in the number of verbal interventions.
- Humor occur at the end.
- Increased demands on the commander.
- More regular situation updates.

4 CONCLUSION & PERSPECTIVES

\Rightarrow New immersive technologies, such as VR, can contribute to the study of nontechnical skills, particularly communication.

What's new?

Non-domain-specific immersive environment

X

Assessing communicational skills

- For professionals : continuing education and occupational risk reduction purposes.
- For researchers : studying various interaction situations.

What's next?

- Future research : different demographic = targeting professionals already employed in various industries.
- Compare the communication skills of future professionals Vs professionals already employed.
- The Debriefing process after simulation \Rightarrow engage in a process of reflexivity.
- Use the VR simulation as a method for establishing an appropriate environment conducive to smart education [3].
- Measure the long-term effects of VR training on communication skills.

[1] Flin R, O'connor P, Crichton M. Safety at the Sharp End: A Guide to Non-technical Skills. CRC Press; 2017.

[2] Miskovic D, Hull L, Moorthy K, et al. Self vs expert assessment of technical and non-technical skills in high fidelity simulation. Am J Surg. 2011;202(4):500-506.

[3] N. Ye. Dmitrenko, O. V. Voloshyna, S. S. Kizim, K. V. Mnyshenko, and S. V. Nahorniak, "Smart education in the prospective teachers' training," CTE Workshop Proc., vol. 10, pp. 414-429, Mar. 2023, doi: 10.55056/cte.568.