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VirtHuLab Telepresence Scale (VTS): preliminary data for a multidimensional tool

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INTRODUCTION

As **psychological processes** increasingly unfold in virtual and hybrid environments (Hadi & Park, 2024; Soh et al., 2024), understanding **telepresence** is essential because it can shape people's digital experiences (Barranco Merino et al., 2023).

However, current **assessments** often struggle to capture the complexity of telepresence, either focusing on **narrow aspects** or using long user experience measures that can be **challenging** to implement in practice.

AIM AND HYPOTHESIS

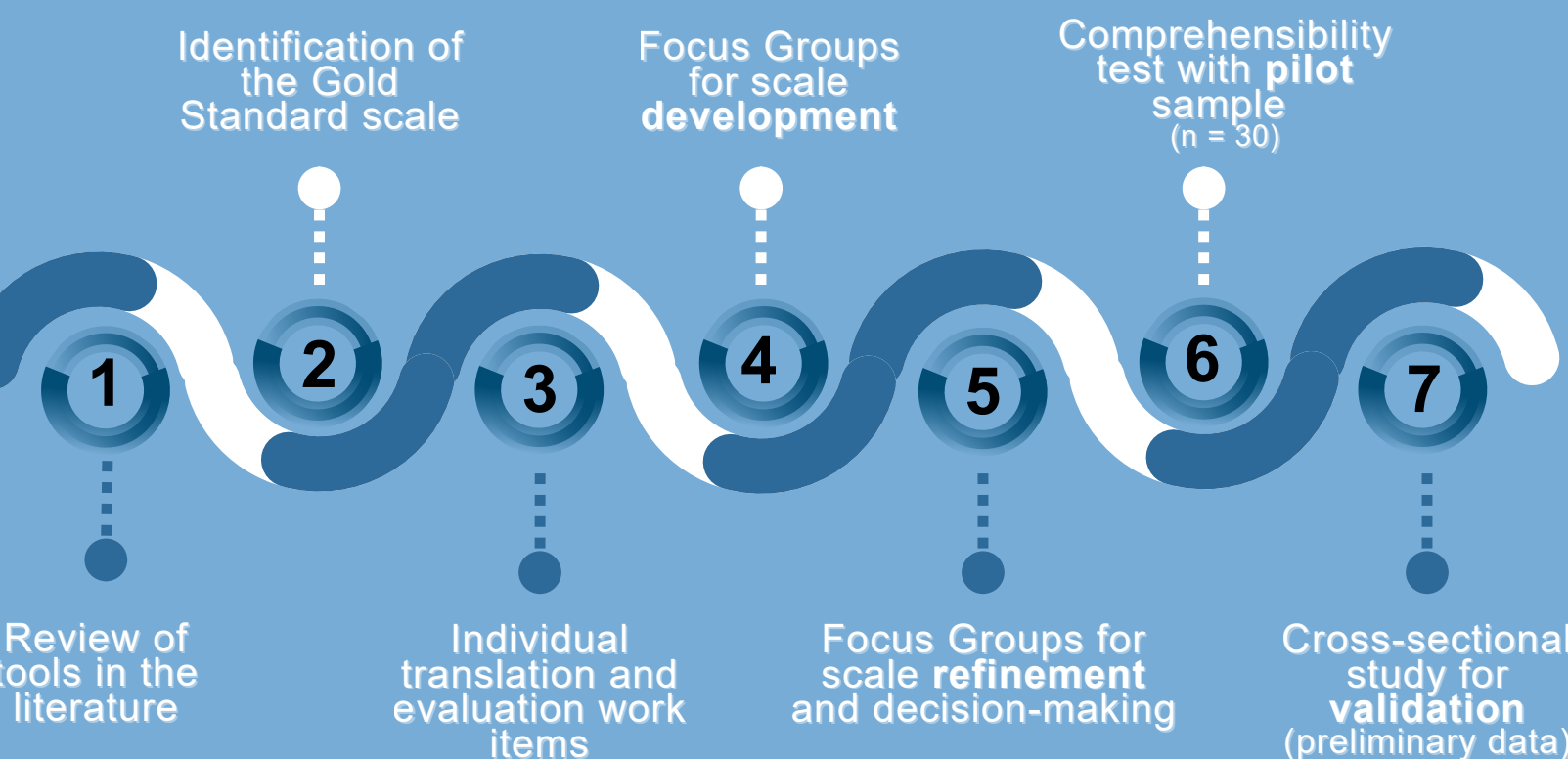
This study aims to develop and **validate a multidimensional** self-report instrument that can provide an up-to-date assessment of telepresence and the associated core psychological dynamics.

Hypotheses for preliminary analyses:

- **H1** = Significant positive correlations between VTS scale scores and the UX reference scale (convergent validity).
- **H2** = Significant differences between the experimental conditions, as detected by the VTS scale (discriminant validity).

METHODS

➤ Mixed methods approach



➤ Convenience sample:

- n=135 (71.1% females);
- Mean Age=22.90 (s.d.=3.86)

➤ Selection criteria:

- ≥18 years old
- Fluency in Italian

➤ Task: Exploration of a digital forest environment (Wakamarina Valley New Zealand, (2025):

- with a personal computer (PC, Step 2A);
- with virtual reality (VR, Step 2B);
- in a third condition (Darkness, Step 3A), a relaxation task (Norealli et al., 2018) was performed in dim lighting.

➤ Randomised order of conditions



RESULTS

➤ Pearson's correlations among the scale's factors and internal reliability

Factors	Engagement	Ergonomy	Presence	Cybertime	Flow	
Engagement	1					$\alpha=.884$
Ergonomy	0.366***	1				$\alpha=.887$
Presence	0.727***	0.379***	1			$\alpha=.830$
Cybertime	0.494***	n.s.	0.407***	1		$\alpha=.772$
Flow	0.490***	0.453***	0.488***	0.281***	1	$\alpha=.785$

Notes: * = p.<0.05; ** = p.<0.01; *** = p.<0.001

➤ Pearson's correlations with UX scale (Tcha-Tokey et al., 2016)

Factors	VTS Engagement	VTS Ergonomy	VTS Presence	VTS Cybertime	VTS Flow	
UX - Engagement	.818***	.411***	.656**	.557***	.425***	Scale under validation
UX - Presence	.699***	.487***	.727***	.389***	.488***	
UX - Immersion	.739***	.305***	.691***	.594***	.441***	
UX - Flow	.383***	.377***	.368***	.398***	.242*	

Notes: VTS = VirtHuLab Telepresence Scale; UX = User Experience in Immersive Virtual Environments Scale (Tcha-Tokey et al., 2016); * = p.<0.05; ** = p.<0.01; *** = p.<0.001

➤ No differences related to sociodemographics were found (i.e. gender, age or education).

➤ Explorative Factorial Analysis (EFA)

Items	Factors	Items	Factors
	Engagement Ergonomy		Presence Cybertime Flow
n.10	0.921	n.36	0.916
n.7	0.786	n.30	0.738
n.28	0.775	n.37	0.650
n.3	0.708	n.12	0.589
n.27	0.694	n.8	0.503
n.26	0.672	n.42	0.918
n.44	0.610	n.45	0.890
n.4	0.866	n.16	0.512
n.5	0.850	n.20	0.874
n.1	0.814	n.17	0.777
n.15	0.794	n.19	0.744
n.13	0.737		
n.14	0.703		

- Kaiser criterion (Kaiser, 1960)
- Promax rotation
- 24 items on a 1-5 Likert scale (from "not at all" to "extremely")
- 66.67% of the variance is explained by the five factors

➤ Discriminant analyses among the conditions

Paired differences	Means	Means' Delta	Student's t	p value	Cohen's d
VTS - Engagement (PC) - VTS - Engagement (VR)	19.75 27.05	-7.304	-14.976	.001	5.666
VTS - Engagement (Dark) - VTS - Engagement (VR)	17.24 27.05	-9.815	-16.454	.001	6.931
VTS - Ergonomy (PC) - VTS - Ergonomy (VR)	22.88 17.04	5.844	11.471	.001	5.920
VTS - Ergonomy (Dark) - VTS - Ergonomy (VR)	23.50 17.04	6.467	12.518	.001	6.002
VTS - Presence (PC) - VTS - Presence (VR)	12.26 15.78	-3.519	-9.005	.001	4.540
VTS - Presence (Dark) - VTS - Presence (VR)	13.45 15.78	-2.326	-4.936	.001	5.476
VTS - Cybertime (PC) - VTS - Cybertime (VR)	7.54 10.41	-2.874	-11.045	.001	3.023
VTS - Cybertime (Dark) - VTS - Cybertime (VR)	8.47 10.41	-1.948	-7.500	.001	3.018
VTS - Flow (PC) - VTS - Flow (VR)	10.16 11.06	-0.896	-3.898	.001	2.672
VTS - Flow (Dark) - VTS - Flow (VR)	10.79 11.06	-0.274	-0.860	.196	3.704

Notes: VTS = VirtHuLab Telepresence Scale

DISCUSSION AND CONCLUSIONS

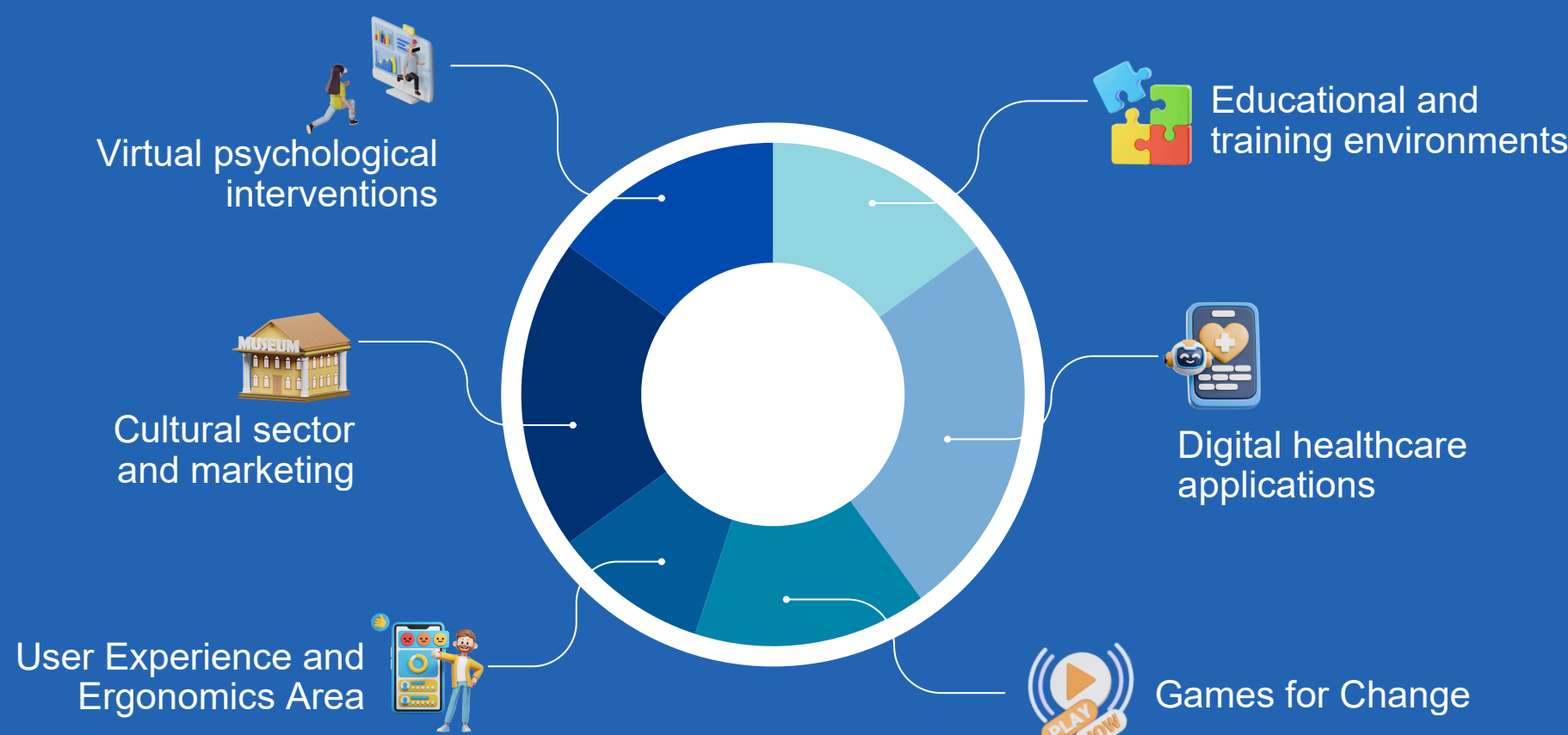
➤ **Preliminary results** support the **initial validation** of the scale, which needs to be confirmed by expanding the sample and conducting Confirmatory Factor Analysis (CFA).

➤ The correlations among the various factors of the scale reflect the **multidimensionality** and complexity of telepresence, and are consistent with findings from previous literature (e.g., Chen et al., 2024; Felton & Jackson, 2022).

➤ Preliminary correlation analyses indicate **convergence** between the factors of the scale and the corresponding constructs in the reference questionnaire.

➤ Preliminary analyses indicate a **discriminative capacity** among differently immersive conditions, in line with the reference scale, and previous literature (e.g., Fusco & Tieri, 2022).

➤ The scale could be used in **different areas** to measure the impact of telepresence on various processes.



REFERENCES

Barranco Merino, R., Higuera-Trujillo, J. L., & Linares Millán, C. (2023). The use of sense of presence in studies on human behavior in virtual environments: A systematic review. *Applied Sciences*, 13(24), 13095.

Chen, C., Hu, X., & Fisher, J. (2024). What is 'Being There'? an ontology of the immersive experience. *Annals of the International Communication Association*, 1-24.

Felton, W. M., & Jackson, R. E. (2022). Presence: A review. *International Journal of Human-Computer Interaction*, 38(1), 1-18.

Fusco, A., & Tieri, G. (2022). Challenges and perspectives for clinical applications of immersive and non-immersive virtual reality. *Journal of Clinical Medicine*, 11(15), 4540.

Hadi, R., & Park, E. S. (2024). Bridging the digital and physical: The psychology of augmented reality. *Current Opinion in Psychology*, 59, 101842.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement*, 20(1), 141-151.

Norelli, S. K., Long, A., & Krepps, J. M. (2018). *Relaxation techniques*. StatPearls Publishing, Treasure Island (FL).

Soh, S., Talaifar, S., & Harari, G. M. (2024). Identity development in the digital context. *Social and Personality Psychology Compass*, 18(2), e12940.

Tcha-Tokey, K., Christmann, O., Loup-Escande, E., & Richir, S. (2016). Proposition and validation of a questionnaire to measure the user experience in immersive virtual environments. *International Journal of Virtual Reality*, 16(1), 33-48.

HTC Vive. (2019). Retrieved from: <https://www.vive.com/en/>

Wakamarina Valley. (2025). Wakamarina Valley, New Zealand. Retrieved from: https://store.steampowered.com/app/1291330/Wakamarina_Valley_New_Zealand/



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