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Using 360 VR Video to Improve the Learning Experience in Veterinary Medicine University Degree

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360 VR Video for Veterinary Medicine University Degree

Project Objectives

- 360VR video for practical lessons on horse surgical pathology and surgery
 - 4th year undergrads
 - Help in the retention of content → difficult to access the hospital outside lesson times
 - Part of the regular course → students are evaluated of those contents
- Analyze the QoE reported by students
 - Impact of presence factors on passive VR (videos) for education
 - Understand student satisfaction
 - Validate the use of compact questionnaires

University Veterinary Hospital



Content Preparation and Delivery



Content evaluation

Questionnaires

- Temple Presence Inventory (TPI)
- Simplified Simulator Sickness Questionnaire (sSSQ)
- Distributed Reality Experience Questionnaire (DREQ), including
 - Net Promoter Score (NPS)

Temple Presence Inventory

- By Lombard & Ditton & Weinstein,
 - Based on analysis of existing presence questionnaires + experimentation
- 42 items (questions) in 8 categories (presence factors)
- Covering spatial and social presence
- Easy to adapt (remove some sections)
- Mostly 7-point Likert scale
- We represent it normalized into (-1, 1)

Presence factors:

- Spatial (“being there”)
- Social presence-actor (“interact to people”)
- Passive social (“observe people voices, etc”)
- Active social (“smile/talk to people”)
- Engagement (“mental immersion”)
- Social richness (e.g. “remote” vs “immediate”)
- Social realism (“would occur in real world”)
- Perceptual realism (“feel, touch, temperature”)

Lombard, M., Ditton, T. B., & Weinstein, L. (2009, November). Measuring presence: the temple presence inventory. *In Proceedings of the 12th Annual International Workshop on Presence* (pp. 1-15).

Simplified Simulator Sickness Questionnaire

- Questions to cover globally the main SSQ elements:
- Are you experimenting now any of these symptoms?:
 - Headache, eyestrain, difficulty focusing (OCULOMOTOR)
 - Vertigo, dizziness (DISORIENTATION)
 - Stomach awareness, nausea (NAUSEA)

Distributed Reality Experience Questionnaire

- Bell Labs tool to evaluate interactive video-based XR experiences (“Distributed Reality”).
- Removed questions that don’t apply

	Factor	Question
Presence	Spatial Presence (SPRE) ¹	I felt like I was actually there <i>in the remote environment</i>
	Local Perception (LPER)¹	I was aware of the events occurring <i>in the real world around me</i>
	Task Completion (TASK) ¹	I was able to <i>complete the task</i> as if it happened <i>in the real world</i>
	Remote Interaction (LINT)¹	I was able to interact normally with the <i>elements of the remote environment</i>
AV Quality	Local Interaction (LINT)¹	I was able to interact normally with the <i>objects of the real world</i>
	Remote Quality (REMQ) ²	Please rate the perceived quality of the <i>remote environment</i>
Sickness	Local Quality (LOCQ)²	Please rate the perceived quality of <i>your local reality (your hands, etc.)</i>
	In-Experience CS (IECS) ³	Did you feel any sickness or discomfort during the experience? Please rate it
	Post-experience CS (PECS) ³	Are you feeling any sickness or discomfort now (after the experience)? Please rate it
QoE	Global QoE (GQOE) ⁴	How would you rate the quality of the experience globally?
	Would Recommend (WDRC) ⁴	How likely is that you would recommend this experience to a friend or colleague?

A.Villegas, P.Perez, E. Gonzalez-Sosa, R. Kachach and J. J. Ruiz. “Towards a distributed reality: a multi-video approach to XR”. Submitted to IEEE VR 2019.

Content evaluation

Experimental setup

Experiment evaluation:

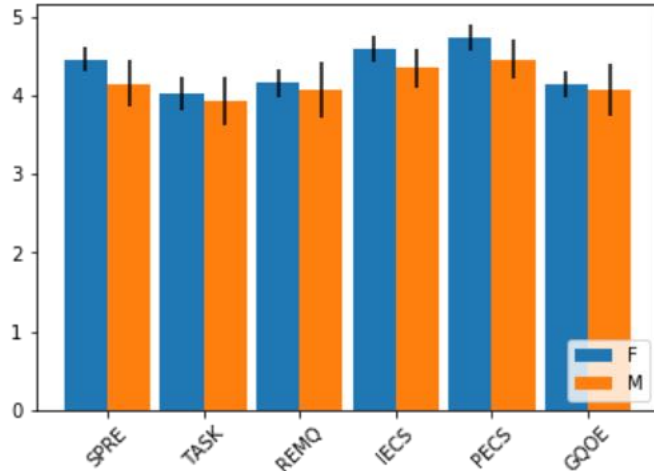
- 100 students (75% female, 25% male)
- Watch the videos → answer questionnaires
- Samsung Galaxy 8+, Samsung Gear VR, noise-cancelling headphones



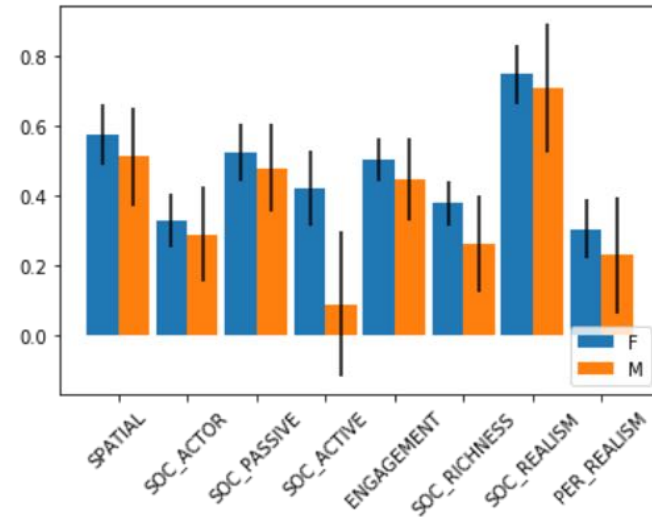
Results

TPI and DREQ, by gender

- 78% rate the experience as good or excellent
- MOS > 4 for all categories
- Female slightly better opinions (< CI)



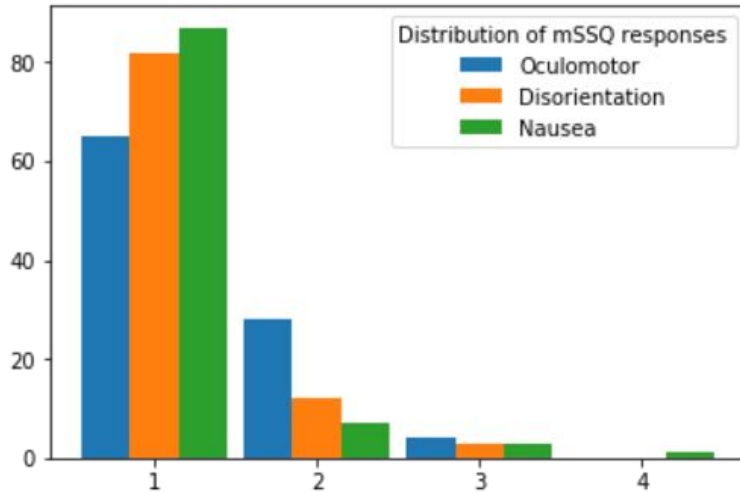
- High social realism
- Moderately high spatial presence
- Inter-gender difference in social active



Results

Cybersickness

- Small cybersickness (35% of light oculomotor discomfort)
- Low correlation between cybersickness factors



Correlation between mSSQ and DREQ cybersickness factors.

	IECS	PECS	OCUL	DISO	NAUS
IECS	1.00	0.72	-0.52	-0.49	-0.13
PECS	.	1.00	-0.57	-0.60	-0.30
OCUL	.	.	1.00	0.53	0.34
DISO	.	.	.	1.00	0.36
NAUS	1.00

Results

Net Promoter Score

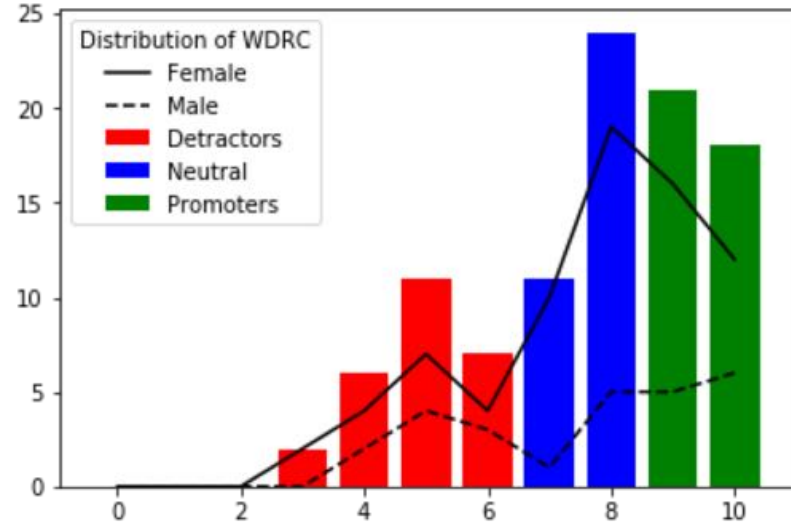
“How probable is that you would recommend this to a friend or colleague?”

→ Classify into

- Promoters (9-10)
- Neutral (7-8)
- Detractors (0-6)

$$NPS = 100\% \frac{P - D}{P + D + N}$$

→ NPS = 14% (not bad)

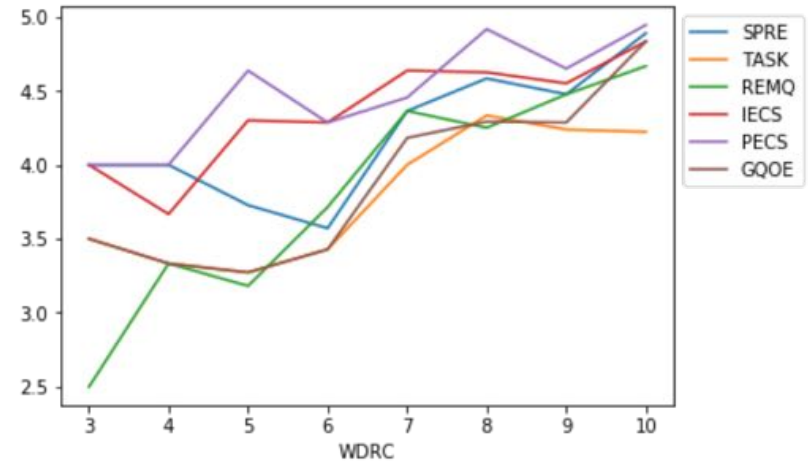
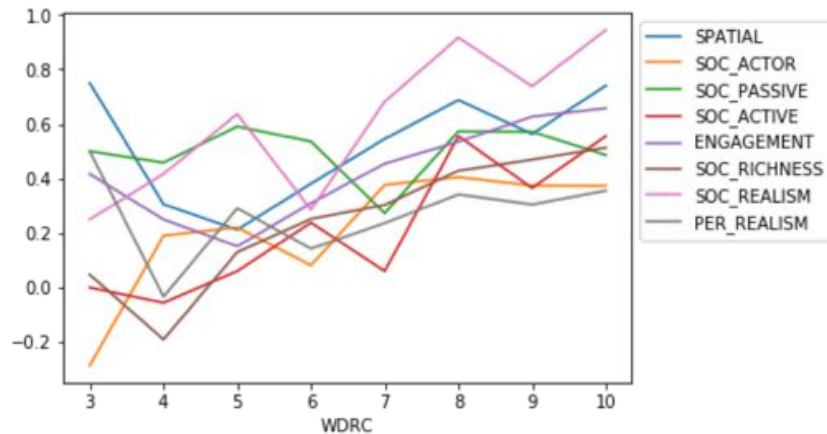


Reichheld, Frederick F. "The one number you need to grow." Harvard business review 81.12 (2003): 46-55.

Results

Net Promoter Score

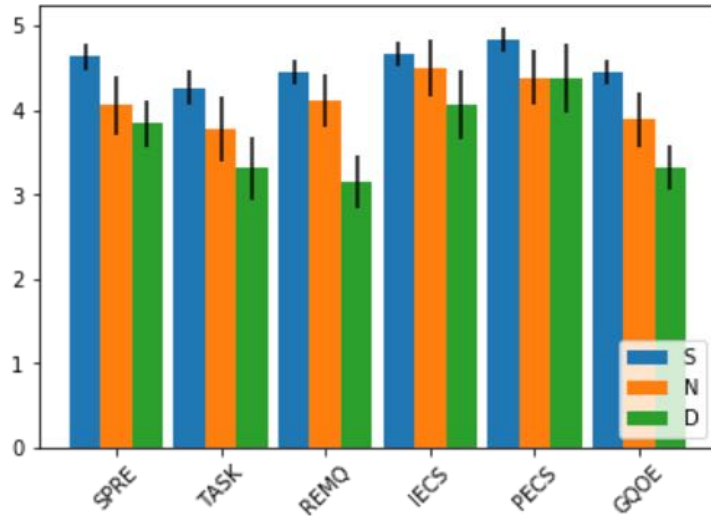
- But... classification into P,N,D (as per the original paper) was based on a clustering of the people under test
- Here 8-raters are clearly supporters → we use a modified NPS
 - D = (0-5), N = (6-7), P = (8-10)
 - NPS = 44%



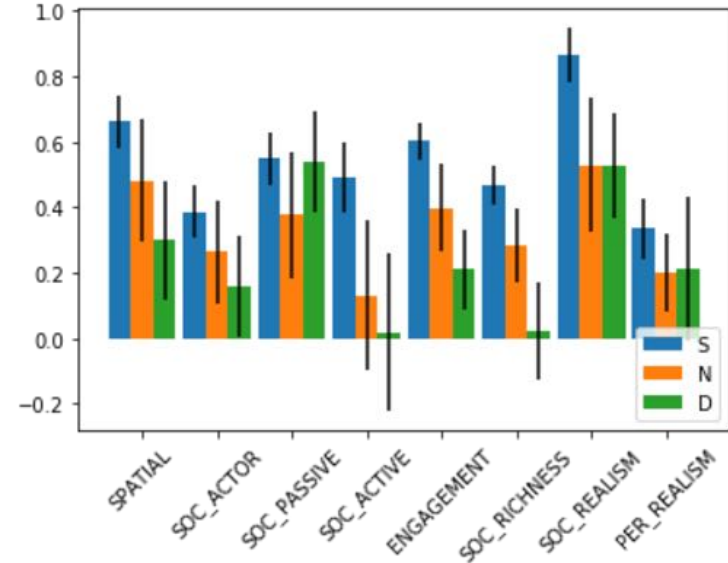
Results

TPI and DREQ by (modified) NPS

- **Effective clustering of users**
- Strongest differences in VQ/QoE
- Smallest differences in CS



- Strongest effect: social active, engagement, social richness



Conclusions

- Successfully integrated VR content into actual practical lessons
- Good acceptance and quality for this kind of experiences / contents
- Net Promoter Score
 - Useful clustering tool
 - Need additional questions for calibration (standard partitioning may be misleading)
- Slightly better responses in females (including cybersickness)
- Social presence has better discriminative factor than spatial presence in terms of user satisfaction

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