

Temporal contiguity in Virtual Reality: effect of contrasted narration-animation temporal latencies

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Introduction

Context

Project = design a forest simulator in Virtual Reality (VR).

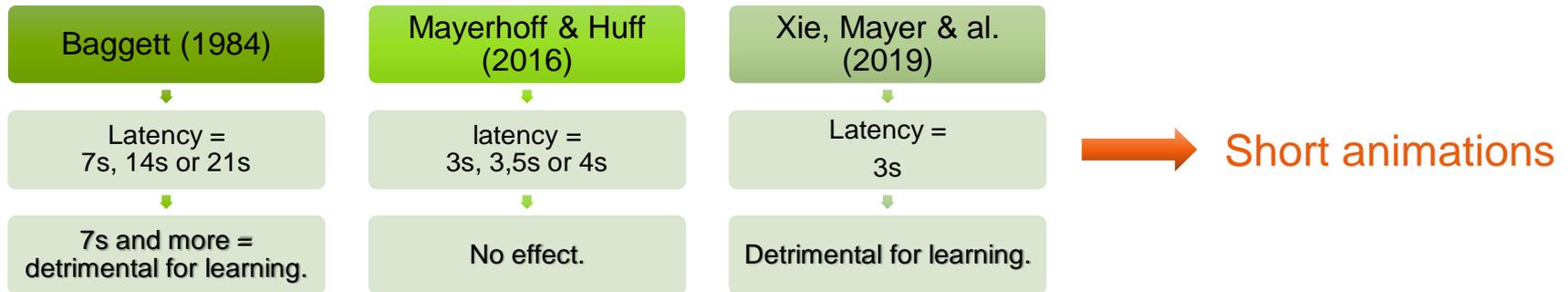
VR = many informations → possible mismatch between visual & verbal information.

Our experimentation = test different temporal latencies between auditory and visual information.

Goal : evaluate the impact of this gap on learning and optimize our simulator.

Previous research

Temporal Contiguity between auditory and visual information in MultiMedia Learning = few research & mixed results.



Our study = a complete lesson in class.

→ new latencies (2 seconds, e.g. inferior to the previous research)

→ contiguity principle applied to Virtual Reality.

Method

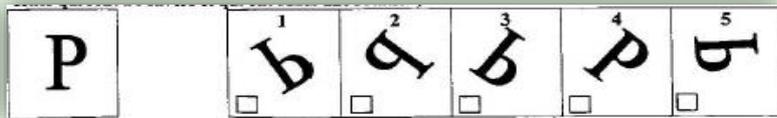
83 children (43 F & 40M) , 12 years
French middle school.

Lesson topic : organic matter decomposition.



Phase 1 : pretests

- Spatial ability test.



- Verbal working memory span test

- MCQ about the lesson topic → prior knowledge (36 Q°)

16	Un sol aéré est un sol riche car il permet aux champignons et aux bactéries de se développer.	VRAI	FAUX	NSP
36	Les collemboles creusent de petites galeries pour aérer le sol et permettre au mycélium et aux bactéries de s'y développer.	VRAI	FAUX	NSP

Phase 2 : test + posttests

- Video : 12 min
- Mismatch between sound and image :



- Text/picture correspondance

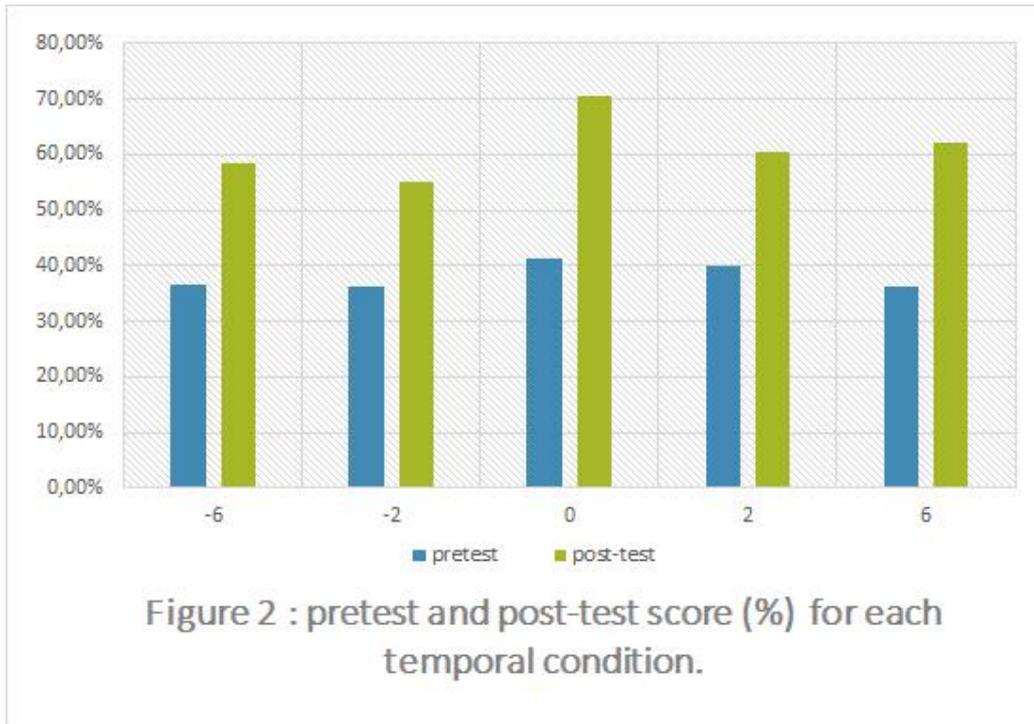
« Sur cette feuille, on peut voir de petits fils blancs. Ce sont des filaments de champignons. On appelle cela le mycélium »

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- MCQ (the same as in the pretest)

Results : *MCQ test*

Homogeneous groups in pre-tests : ($F(4,78) = 0,37$; $p = 0,83$)



(-2/0) : $F(4,78) = 7,96$; $p = 0,004$

(-6/0) : $F(4,78) = 17,1$; $p < 0,001$

- Best results in synchronized mode : temporal contiguity.
- Asymmetry of shift effects : learning is less disrupted when the image is presented before the oral explanation.

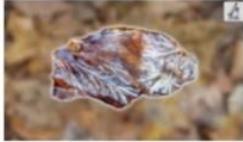
Results : *narration /picture*

3 types of answers:

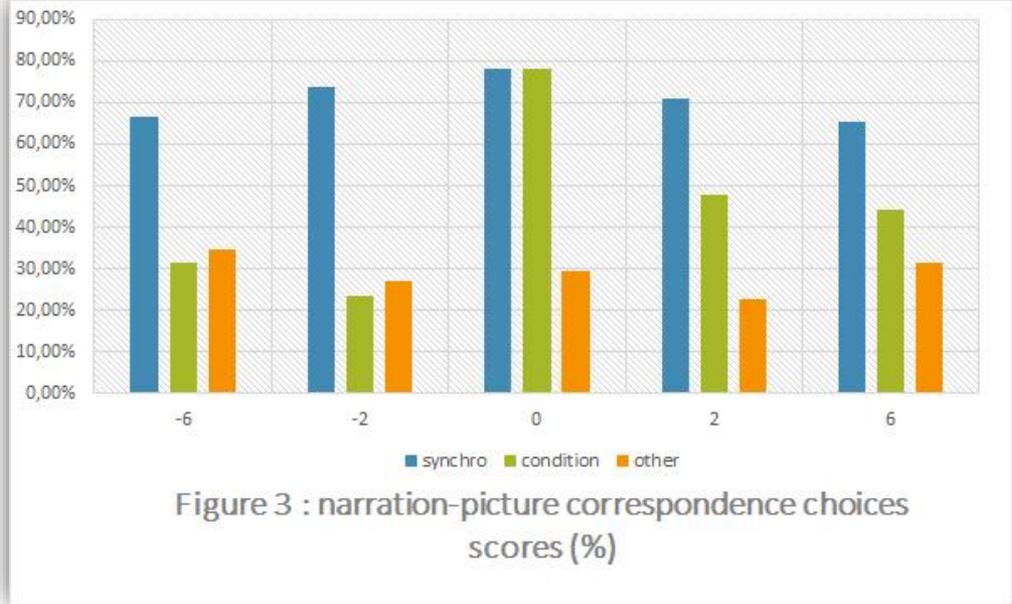
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- the expected choice
- integrated answer
- the non-expected choice



- Synchronized condition mainly chosen ($F(4,78) = 30.20, p < .001$) but less chosen for latency condition groups ($F(2,156) = 107,6, p < .001$).
- asymmetry between -6, -2 and +6, +2 in the choice of the participant's correct condition ($F(8,156) = 6.71, p < .001$).

Conclusion

Our results are in agreement and extend those of Xie, Mayer & al. (2019).

Multimedia learning = better when animation is presented before the spoken explanation.

→ It would be easier to keep the image in working memory for future verbal information matching.

We are currently replicating this experiment with a larger sample and analyzing eye movements.

Then it will be possible to test temporal contiguity in immersive VR.

→ + optimize our forest simulator

References

- Baggett, P. (1984). Role of temporal overlap of visual and auditory material in forming dual media associations. *Journal of Educational Psychology*, 76(3), 408-417.
- Meyerhoff, H. S., & Huff, M. (2016). Semantic congruency but not temporal synchrony enhances long term memory performance for audio-visual scenes. *Memory & Cognition*, 44(3), 390-402.
- Xie, H., Mayer, R. E., Wang, F., & Zhou, Z. (2019). Coordinating visual and auditory cueing in multimedia learning. *Journal of Educational Psychology*, 111(2), 235-255.

Thank you for your attention

