

Audiovisual Integration in the Depth Dimension: An Asymmetrical Effect of Distance on the Temporal Profile of Multisensory Gain and Binding

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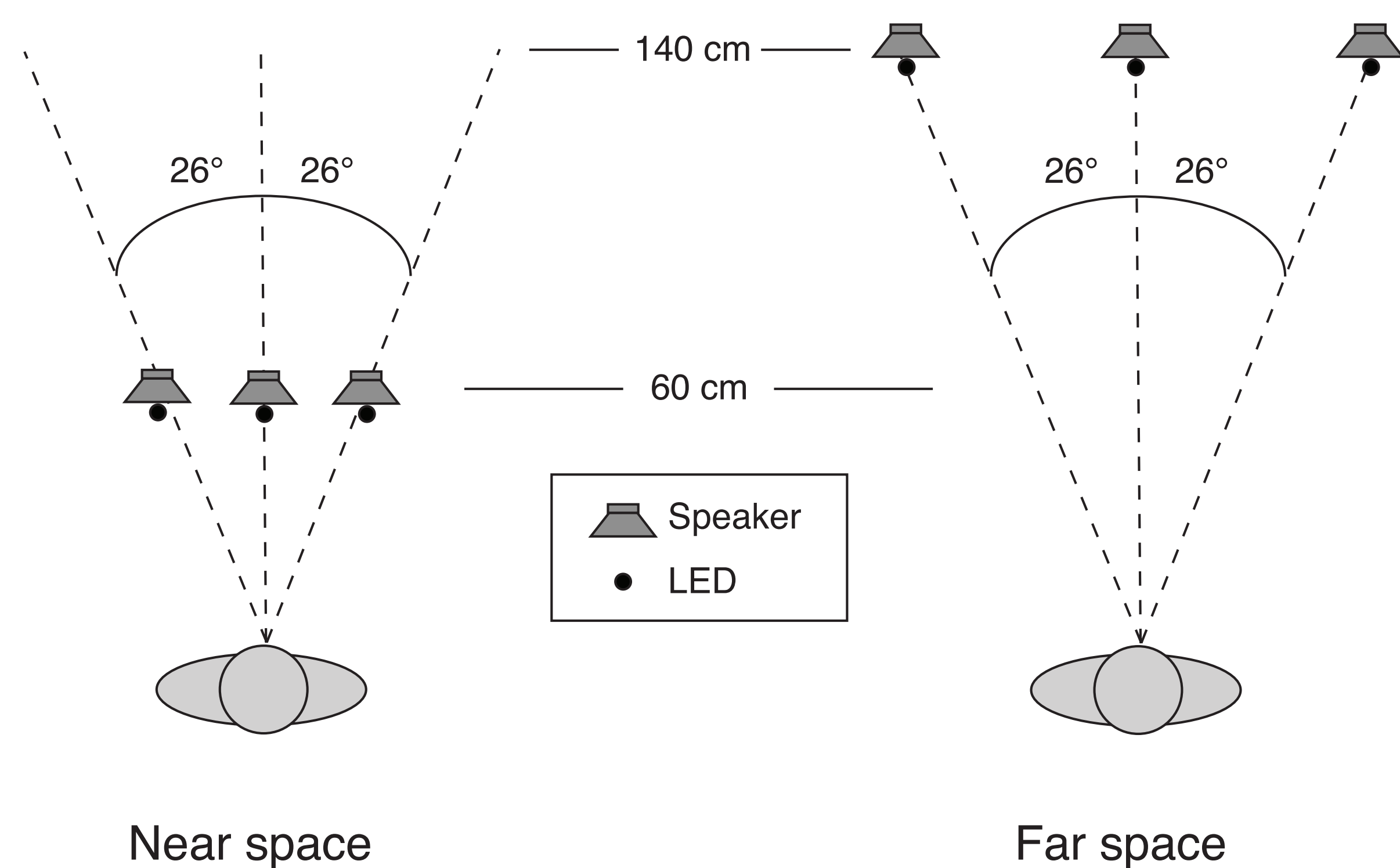
Background

- Relatively little is known regarding how stimulus-observer distance affects multisensory integration (MSI).
- Previous findings indicate a greater tendency of temporal binding in near than far space¹.
- Multisensory gain has been shown to be greater in far than in near space².
- Aim: Investigate the trade-off between temporal binding and multisensory gain in near and far space.

Methods

- Simultaneity judgement task (AV, SJ task)
- Redundant Target Effect task (A, V, AV, RTE task)
 - Implicit spatial discrimination
 - Go: Left, Right, No Go: Center
- SOAs: ± 350 , ± 250 , ± 150 , ± 50 , 0 ms
- Near and Far space

Setup

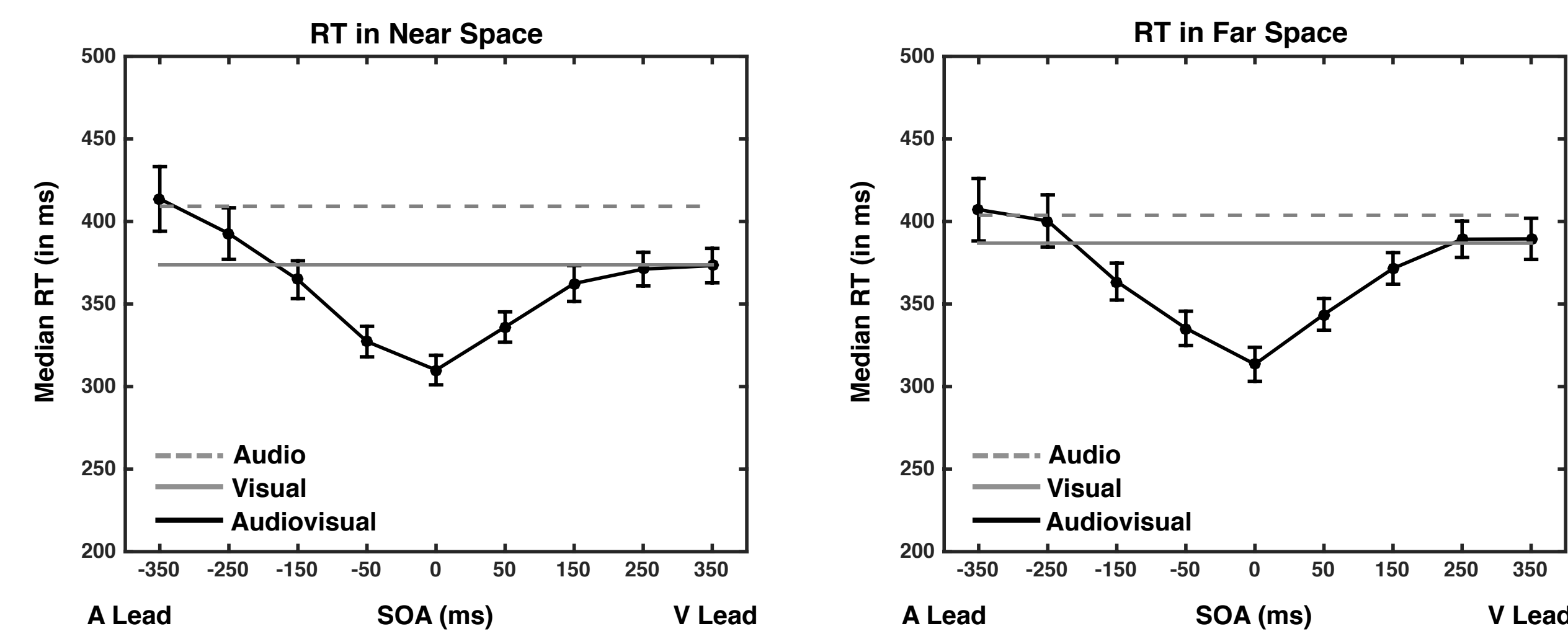


Results

Accuracy

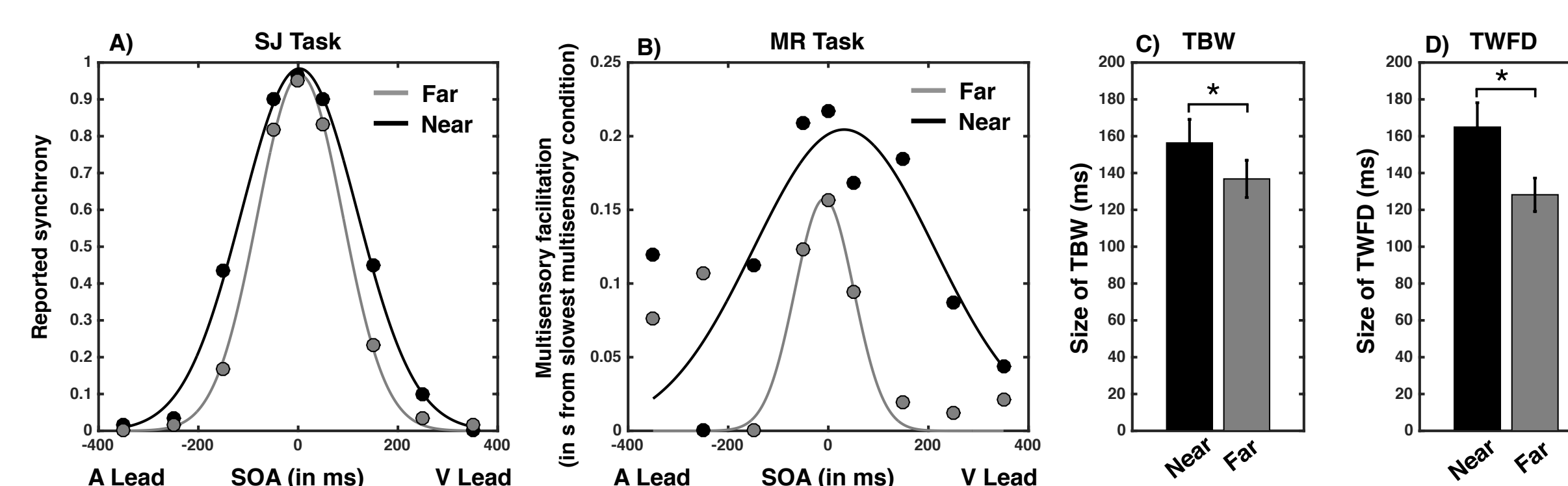
	A	V	AV
Go trials	.95	.97	.99
No-go trials	.28	.19	.30

Response times



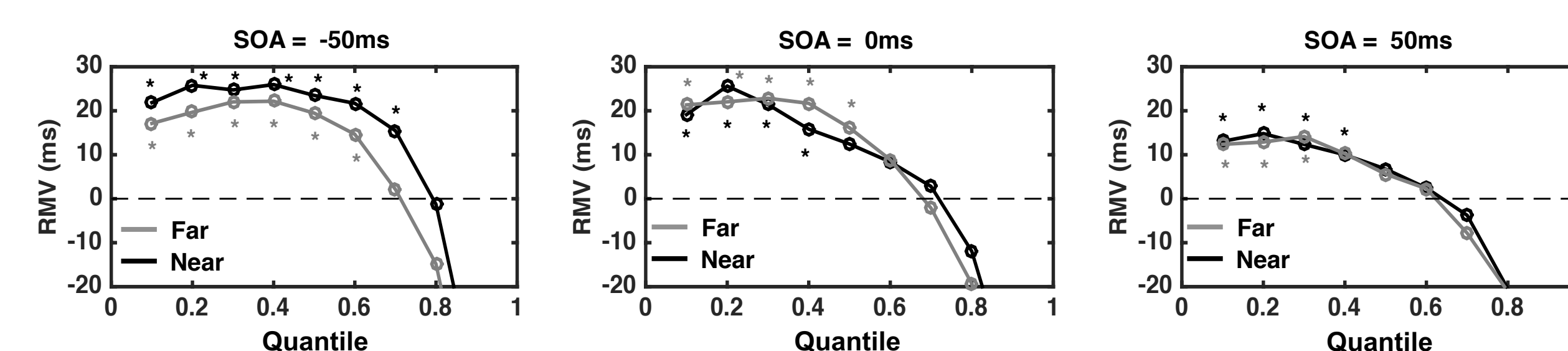
The temporal profile of response times in near and far space. There was significant enhancement at the -50, 0, and 50 ms SOA in both near and far space.

Temporal profile of multisensory interactions

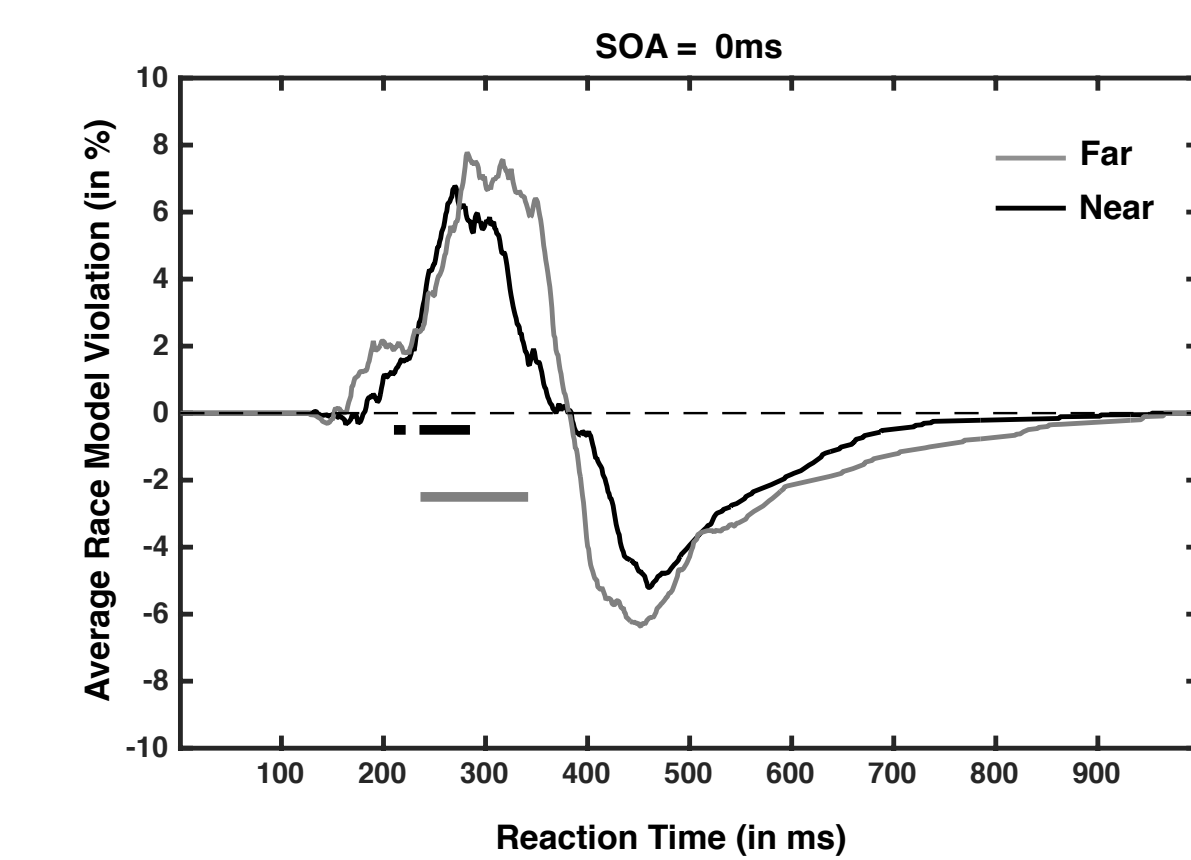


Temporal binding windows (TBW) and temporal windows of fastest detection (TWFD) were larger in near than in far space (N = 32). Both in the SJ and RTE task.

Race model inequality violations



Results



Multisensory integration as index by race model inequality violations³ was evident across a larger range of RTs in far than in near space at 0 ms SOA. There was no correlation between the size of the TBW and the TWFD.

Conclusion

- Temporal acuity was poorer in near relative to far space
- The range of reaction times over which MRE was observed was somewhat greater in far space, but only for synchronously presented stimuli.
- The findings seemingly suggest that while the multisensory gain and binding subsystems are partially yoked (i.e., push-and-pull relationship), they are nonetheless independent.

References

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2. Van der Stoep, N., Van der Stigchel, S., Nijboer, T. C. W., & Van der Smagt, M. J. (2016a). Audiovisual integration in near and far space: Effects of changes in distance and stimulus effectiveness. *Experimental Brain Research*, 234(5), 1175-1188. DOI: 10.1007/s00221-015-4248-2
3. Ulrich, R., Miller, J., & Schröter, H. (2007). Testing the race model inequality: An algorithm and computer programs. *Behavior Research Methods*, 39(2), 291-302.

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