

High contextual interference practice enhances motor acuity retention

and transfer in a pointing task

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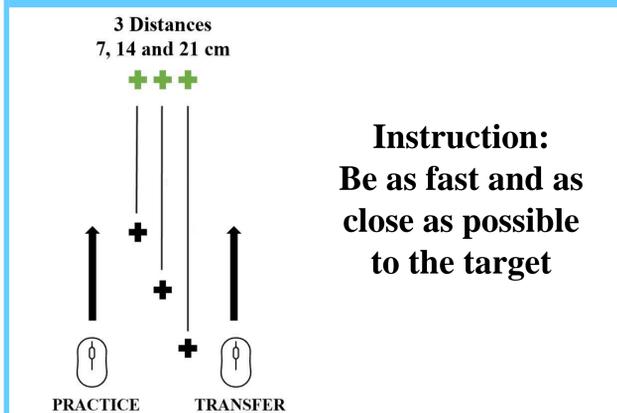
LEGEND

- M** **Accuracy** (i.e., error) is the mean target/click distance in cm
- SD** **Precision** is the variability in the target/click distance in cm
- Speed** is the movement time over the distance in cm/s
- Blocked condition:** in each block only one on distance is practiced
- Random condition:** in each block all distances are practiced in an unpredictable

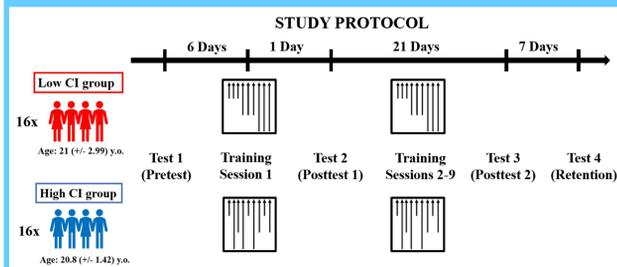
INTRODUCTION

- The retention/transfer of Motor Skills Learning (MSL) is an important goal of training programs (Soderstrom & Bjork, 2015)
- A bulk of evidence demonstrated that contextual interference (CI) – i.e., the manipulation of the order of the task practiced during training – is associated with worse performance during acquisition but better long-term retention and transfer (Magill & Hall, 1990)
- CI effects are well established in complex tasks involving memory and motor processes but not on motor acuity learning in long-term training programs
- Motor acuity learning is the shift in the speed-accuracy function driven by a reduction in movements variability as effect of practice (Krakauer et al., 2019)
- Behavioral description of changes associated with motor acuity learning have been extensively investigated in animals but are lacking in humans (Krakauer et al., 2019)
- Our main hypothesis is that the group training in High CI (vs Low CI) condition will have a worse motor acuity performance during the acquisition but will have a better retention of the skill as well as greater transfer to the untrained hand and distances**

TASK

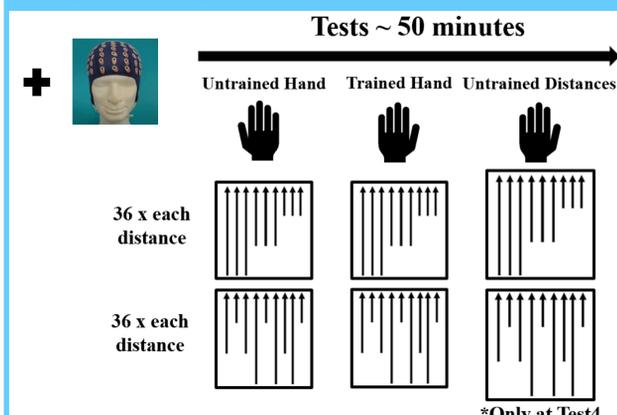


PROTOCOL

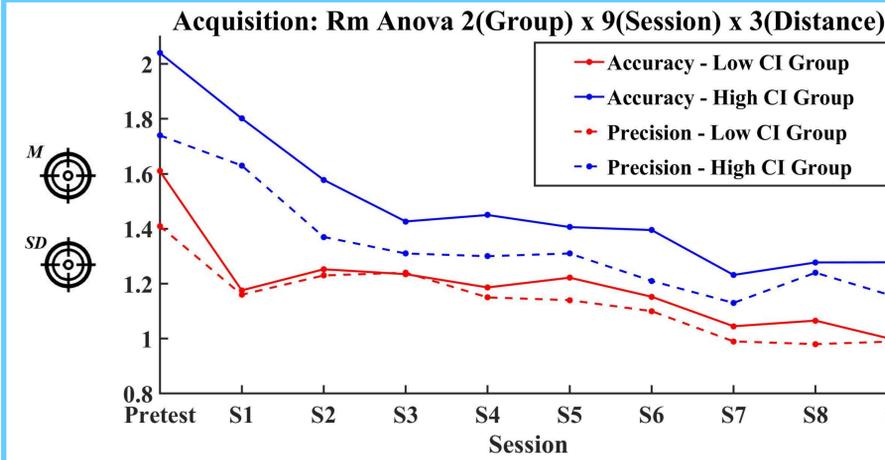


Each group trains one of the two conditions of the task (random or blocked) but are tested in both conditions

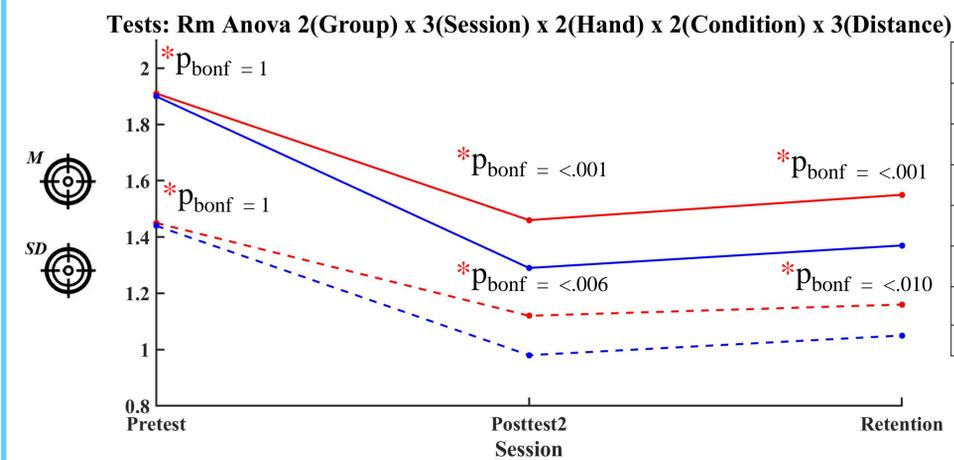
TEST SESSIONS



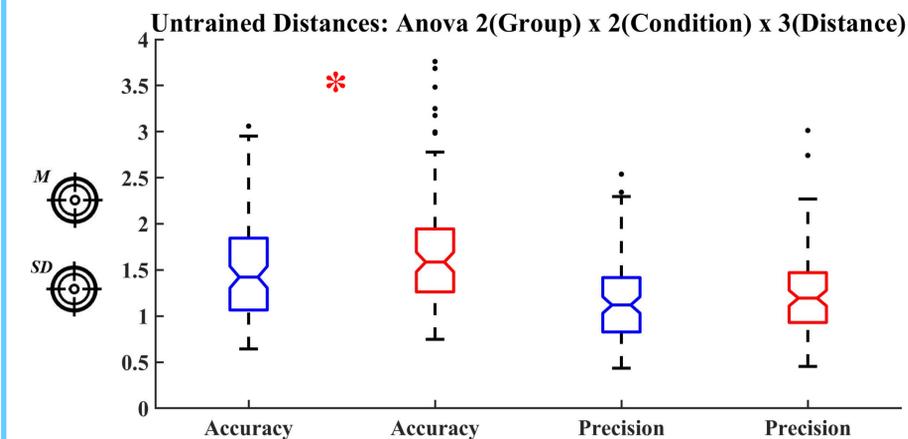
RESULTS



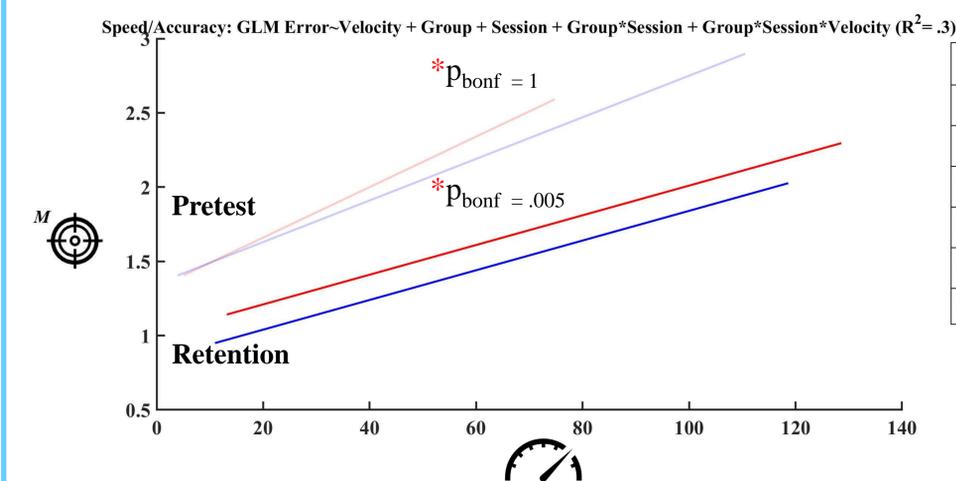
	Accuracy	Precision
	p-value	p-value
G	<.001	<.001
S	<.001	<.001
D	<.001	<.001
G X S	.031	.053



	Accuracy	Precision
	p-value	p-value
G	<.001	<.001
S	<.001	<.001
H	<.001	<.001
C	<.001	<.001
D	<.001	<.001
G X S	.006	.022



	Accuracy	Precision
	p-value	p-value
G	.004	.054
C	<.001	<.001
D	<.001	<.001



	Speed/Accuracy
	p-value
V	<.001
G	.30
S	.044
G X S	.047
G X S X V	.11

DISCUSSION

- We found typical CI effects as random training led to worse performance during acquisition but greater retention of the skill and a better transfer to the untrained hand and distances (Magill & Hall, 1990)
- It is the first study to demonstrate that long-term random training is beneficial to motor acuity learning
- We provided a rare picture of the behavioral changes associated with motor acuity learning and showed that they are similar to what has been described in animals (Krakauer et al., 2019)
- It is necessary to determine how these laboratory results can be implemented in real life training programs

References

- Krakauer, J. W., Hadjiosif, A. M., Xu, J., Wong, A. L., & Haith, A. M. (2019). Motor Learning. *Comprehensive Physiology*, 9(2), 613–663. <https://doi.org/10.1002/cphy.c170043>
- Magill, R. A., & Hall, K. G. (1990). A review of the contextual interference effect in motor skill acquisition. *Human Movement Science*, 9(3), 241–289. [https://doi.org/10.1016/0167-9457\(90\)90005-X](https://doi.org/10.1016/0167-9457(90)90005-X)
- Soderstrom, N. C., & Bjork, R. A. (2015). Learning Versus Performance: An Integrative Review. *Perspectives on Psychological Science*, 10(2), 176–199. <https://doi.org/10.1177/1745691615569000>