

Supplemental Material S1. PML used in the analysis.

1. Practice dose—that is, the amount of practice required to achieve a change in performance (Edeal & Gildersleeve-Neumann, 2011). Here high frequency practice (100–150 trials per session) has been shown to promote better motor learning than low frequency practice.
2. Practice distribution—that is, the distribution of the amount of practice over a length of time (Klingels et al., 2013; Maas et al., 2014) e.g., four times a week for three weeks has been shown to promote better motor learning than distributed practice of once per week for 12 weeks.
3. Practice variability—Varied practice targets are preferred over constant (consistent) practice targets, although constant practise is more effective in the acquisition of new skills (Demers et al., 2021; Park & Shea, 2005).
4. Practice schedule—that is, targets movements are each practised in separate blocks, or they are combined in random order. Random practice is believed more effective than blocked practice (e.g., Prado et al., 2017), but other studies show inconsistent findings between random and blocked practice in the acquisition of new skills (Maas & Farinella, 2012; Scheiner et al., 2014).
5. Attentional focus—that is, internal (individual movements or sensations) or external (achievement of the movement goal) focus of attention. Here an external focus is shown to promote better motor learning than an internal focus (Lisman & Sadagopan, 2013).
6. Target complexity—Complex targets are preferred over simple targets (Maas et al., 2019).
7. Feedback conditions—there is inconclusive evidence on the effectiveness of feedback about knowledge of performance over knowledge of results, although knowledge of results is known to be more effective in the retention of skills than knowledge of performance (Knock et al., 2000).
8. Feedback frequency—that is, the frequency with which feedback is provided throughout the practice (Burtner et al., 2014; Maas & Farinella, 2012). Feedback that starts in high frequency and gradually decreases to low frequency has been shown to promote motor learning.
9. Feedback timing—that is, immediate or delayed feedback. Delayed feedback has been shown to promote better motor learning than immediate feedback (Hula et al., 2008).

References

- Burtner, P. A., Leinwand, R., Sullivan, K. J., Goh, H. T., & Kantak, S. S. (2014). Motor learning in children with hemiplegic cerebral palsy: Feedback effects on skill acquisition. *Developmental Medicine & Child Neurology*, 56(3), 259-266.
<https://doi.org/10.1111/dmcn.12364>

- Demers, M., Fung, K., Subramanian, S. K., Lemay, M., & Robert, M. T. (2021). Integration of motor learning principles into virtual reality interventions for individuals with cerebral palsy: Systematic review. *JMIR serious games*, 9(2), e23822. <https://doi.org/10.2196/23822>
- Edeal, D. M., & Gildersleeve-Neumann, C. E. (2011, May). The importance of production frequency in therapy for childhood apraxia of speech. *American Journal of Speech-Language Pathology*, 20(2), 95-110. [https://doi.org/https://dx.doi.org/10.1044/1058-0360\(2011/09-0005](https://doi.org/https://dx.doi.org/10.1044/1058-0360(2011/09-0005)
- Hula, S. N. A., Robin, D. A., Maas, E., Ballard, K. J., & Schmidt, R. A. (2008). Effects of feedback frequency and timing on acquisition, retention, and transfer of speech skills in acquired apraxia of speech. *Journal of Speech, Language, and Hearing Research*, 51(5), 1088-1113. [https://doi.org/10.1044/1092-4388\(2008/06-0042](https://doi.org/10.1044/1092-4388(2008/06-0042)
- Klingels, K., Feys, H., Molenaers, G., Verbeke, G., Van Daele, S., Hoskens, J., Desloovere, K., & De Cock, P. (2013). Randomized trial of modified constraint-induced movement therapy with and without an intensive therapy program in children with unilateral cerebral palsy. *Neurorehabilitation and Neural Repair*, 27(9), 799-807. <https://doi.org/10.1177/1545968313496322>
- Knock, T. R., Ballard, K. J., Robin, D. A., & Schmidt, R. A. (2000). Influence of order of stimulus presentation on speech motor learning: A principled approach to treatment for apraxia of speech. *Aphasiology*, 14(5-6), 653-668. <https://doi.org/10.1080/026870300401379>
- Lisman, A. L., & Sadagopan, N. (2013). Focus of attention and speech motor performance. *Journal of Communication Disorders*, 46(3), 281-293. <https://doi.org/10.1016/j.jcomdis.2013.02.002>
- Maas, E., & Farinella, K. A. (2012). Random versus blocked practice in treatment for childhood apraxia of speech. *Journal of Speech, Language, and Hearing* 5(2), 561-578. [https://doi.org/10.1044/1092-4388\(2011/11-0120](https://doi.org/10.1044/1092-4388(2011/11-0120)
- Maas, E., Gildersleeve-Neumann, C., Jakielski, K., Kovacs, N., Stoeckel, R., Vradelis, H. & Welsh, M. (2019) Bang for your buck: A single-case experimental design study of practice amount and distribution in treatment for childhood apraxia of speech. *Journal of Speech, Language, and Hearing Research*, 26(9), 3160-3182. https://doi.org/10.1044/2019_JSLHR-S-18-0212
- Park, J.-H., & Shea, C. H. (2005). Sequence learning: Response structure and effector transfer. *The Quarterly Journal of Experimental Psychology Section A*, 58(3), 387-419. <https://doi.org/10.1080/02724980343000918>
- Prado, M. T. A., Fernani, D. C. G. L., da Silva, T. D., Smorenburg, A. R., de Abreu, L. C., & de Mello Monteiro, C. B. (2017). Motor learning paradigm and contextual interference in manual computer tasks in individuals with cerebral palsy. *Research in Developmental Disabilities*, 64, 56-63. <https://doi.org/10.1016/j.ridd.2017.03.006>
- Scheiner, L. R., Sadagopan, N., & Sherwood, D. E. (2014). Effects of blocked versus random practice on speech motor skill acquisition and retention. *Journal of Motor Learning and Development*, 2(2), 29-36. <https://doi.org/10.1123/jmld.2013-0028>