

## Effects of Evening vs. Morning Training on Motor Skill Consolidation in Morning-Oriented Elderly

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**Abstract :** The main question addressed in this study was whether the time-of-day wherein training is afforded is a significant factor for motor skill ('how-to', procedural knowledge) acquisition and consolidation into long term memory in the healthy elderly population. Twenty-nine older adults (60-75 years) practiced an explicitly instructed 5-element key-press sequence by repeatedly generating the sequence 'as fast and accurately as possible'. Contribution of three parameters to acquisition, 24h post-training consolidation, and 1-week retention gains in motor sequence speed was assessed: (a) time of training (morning vs. evening group) (b) sleep quality (actigraphy) and (c) chronotype. All study participants were moderately morning type, according to the Morningness-Eveningness Questionnaire score. All participants had sleep patterns typical of age, with average sleep efficiency of ~ 82%, and approximately 6 hours of sleep. Speed of motor sequence performance in both groups improved to a similar extent during training session. Nevertheless, evening group expressed small but significant overnight consolidation phase gains, while morning group showed only maintenance of performance level attained at the end of training. By 1-week retention test, both groups showed similar performance levels with no significant gains or losses with respect to 24h test. Changes in the tapping patterns at 24h and 1-week post-training were assessed based on normalized Pearson correlation coefficients using the Fisher's z-transformation in reference to the tapping pattern attained at the end of the training. Significant differences between the groups were found: the evening group showed larger changes in tapping patterns across the consolidation and retention windows. Our results show that morning-oriented older adults effectively acquired, consolidated, and maintained a new sequence of finger movements, following both morning and evening practice sessions. However, time-of-training affected the time-course of skill evolution in terms of performance speed, as well as the re-organization of tapping patterns during the consolidation period. These results are in line with the notion that motor training preceding a sleep interval may be beneficial for the long-term memory in the elderly. Evening training should be considered an appropriate time window for motor skill learning in older adults, even in individuals with morning chronotype.

**Keywords :** time-of-day, elderly, motor learning, memory consolidation, chronotype

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