

Influence of TMS intensity on the ipsilateral silent period - comparison of RMT-adjusted and maximum stimulator output intensities.

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Introduction: Transcranial magnetic stimulation (TMS) induced ipsilateral silent periods (iSP) provide information on interhemispheric inhibitory drive, but varying methodological approaches in equipment, measurement, and data analysis hamper the comparability and overall reproducibility. Even though it is generally agreed that only pulses above resting motor threshold (RMT) result in reliable occurrence of iSPs, studies differ on intensity conditions, either using fixed % maximum stimulator outputs (MSO) or individualized intensities based on RMT^{1,2}. Our aim was to demonstrate the intensity-dependent changes of iSP parameters and to analyse which intensity configuration, either plotted by RMT or MSO values, predict the effect with a better fit.

Method: We investigated 20 (9 F) right-handed healthy adults between 24y and 67y (M = 38.55, SD = 12.11) using navigated TMS. 50% maximal voluntary contraction of the left first dorsal interosseous muscle was performed during stimulation with intensities of 120%, 150%, 175%, and 200% RMT on the dominant motor hand area. A regression analysis was performed with RMT-adjusted states and their respective percentage of MSO as independent variable each for iSP onset, duration, and depth.

Results: Overall, we found 54 iSPs across all states. In 12 cases, highest RMT states could not be reached due to stimulator output limits, in 14 recordings iSPs were missing. Neither MSO nor RMT intensity correlated with iSP onset. Duration increase was significantly associated with RMT intensity ($p = .013$, $r = .33$), but not with MSO values ($p = .17$, $r = .16$). Contrary, depth increase was significantly associated with MSO intensity ($p = .049$, $r = .26$), with a trend for the RMT model ($p = .096$, $r = .22$).

Discussion: We here demonstrate an intensity-dependent increase in iSP duration and depth, but not onset. Additionally, we did not find a clear difference between the RMT or the MSO approach for the correlation of stimulus intensity to iSP depth or duration. Contrary to previous findings^{1,3}, no evidence of a ceiling effect emerged from our data. Our data suggest that each aspect of the iSP has a different association with increasing TMS intensities. Considering the lacking power for analysis of iSP depth and diverging results further investigation with larger samples is needed to compare the effects of fixed MSO versus RMT-adjusted stimulation increase on iSP measurements.

1: Chen et al., 2003. J. Neurophysiol. 89, 1256–1264.

2: Davidson, T., 2016. In: Tremblay, F. (Ed.), Doctor of Philosophy in Human Kinetics. University of Ottawa.

3: Meyer et al. 1995. Brain 118, 429–440.