The number of full-sine cycles per pulse influences the efficacy of multicycle transcranial magnetic stimulation.

Abstract:
Previous studies have shown that the efficacy of transcranial magnetic stimulation (TMS) to excite corticospinal neurons depends on pulse waveform. OBJECTIVE/HYPOTHESES: In this study, we examined whether the effectiveness of polyphasic TMS can be increased by using a pulse profile that consists of multiple sine cycles. In eight subjects, single-pulse TMS was applied to the left primary motor hand area through a round coil attached to a stimulator device that generated polyphasic pulses consisting of one to six full-sine cycles with a cycle length of 86 µs. In different blocks, we varied the number of sine cycles per pulse and recorded the motor-evoked potential (MEP) from the right first dorsal interosseus muscle. For each stimulus type, we determined resting motor threshold (RMT), stimulus-response curve (SRC), and mean MEP amplitude evoked at maximal stimulator output to assess the efficacy of stimulation. Multicycle pulses were more effective than a single full-sine cycle in exciting corticospinal neurons. TMS with multicycle pulses resulted in lower RMT, larger MEP amplitudes at maximal stimulator output and a steeper slope of the SRC relative to a TMS pulse consisting of a single-sine cycle. The increase in efficacy was already evident when two full-sine cycles were used and did not increase...
further by adding more cycles to the TMS pulse. Increasing the number of full-sine cycles per pulse can improve the efficacy of TMS to excite corticospinal neurons, but there is no simple linear relationship between the number of cycles and TMS efficacy.