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

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 ?s. 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.