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Discussion

Reply to I. Derakhshan “Comments on Sugawara K., & Kasai T. (2002). Facilitation of motor evoked potentials and H-reflexes of flexor carpi radialis muscle induced by voluntary teeth clenching. *Human Movement Science*, 21, 203–212” ☆

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Our study was focused on the neural mechanisms behind the Jendrassik maneuver, that is, the remote facilitation of neural excitability by means of muscle activity (in our case voluntary teeth clenching). In clinical practice, this maneuver is used to reinforce the H-reflex in the lower limb muscles. However, using TMS, Pereon, Genet, and Guihenene (1995) and Hufnagel, Jaeger, and Elger (1990) showed that MEP and spinal facilitation due to the Jendrassik maneuver are very similar, but that MEPs and H-reflexes are not equally sensitive to voluntary commands (Kasai, Toyoda, & Yahagi, 1997). Therefore, the purpose of our study was to reveal the difference between MEP and H-reflex facilitation induced by voluntary teeth clenching. Based on our experimental results, we postulated the existence of two different neural pathways (Sugawara & Kasai, 2002). Recently, we investigated this hypothesis further by using TMS and brainstem electrical stimulation to examine cortical and spinal cord excitability changes in the motor pathways for a hand muscle at several instances during intentional teeth clenching. Consistent with our hypothesis, we found that the hand motor area is facilitated only during the early phase of intentional teeth clenching (i.e., within 50 ms after the onset of masseter muscle contraction), whereas the spinal cord is facilitated at a later phase (after 50 ms), possibly through cortical facilitation (Furubayashi et al., in press).

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Contrary to our study, Derakhshan's commentary is focused on the laterality of human motor function. He is concerned with differences in neural control between the dominant and non-dominant hand. However, as we explained in the previous paragraph, our objective was to uncover the neural mechanisms underlying remote facilitation, be they cortical or spinal or both. For this reason, we did not address the issue of handedness in any great detail in our paper. However, it is well known that the spinal motoneuron pool of the dominant hand differs from that of the non-dominant hand (cf. Adam, De Luca, & Erim, 1998), and that there are hemispheric differences of cognitive functions (including sensory and motor functions) in the human brain. Thus, it would certainly be interesting to investigate whether Jendrassik-induced facilitation differs between the dominant and non-dominant hand, but this would constitute a new research goal relative to ours.

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