Cross education and neuromuscular adaptations during early stage of strength training

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It has been reported in the literature that unilateral strength training induces strength gain not only in the trained limb, but also in the homologous muscles of contralateral limb. This phenomenon is termed cross education. This presentation aims to provide a brief review on the current studies in this area, and highlight the research questions remaining to be answered. The mechanism underlying this phenomenon has been suggested to be a neural adaptation, because no significant muscle structural changes have been found to be associated with the strength gain. The research in our laboratory has shown that unilateral electrical muscle stimulation training can induce a similar magnitude of cross education as voluntary training. This, together with other findings in the literature, raised a question on the potential locations and mechanisms of the neural adaptation. It has been speculated that neural mechanisms at the spinal level might play an important role in cross education. Previously untrained individuals may demonstrate a rapid strength gain during early stage of training, which is likely to be due to improved capacity to activate muscles voluntarily. Whether cross education is solely due to improved muscle activation needs to be examined. It has been repeatedly suggested that cross education have clinical application significance, such as in neuromuscular rehabilitation for patients who experience unilateral injuries or surgical procedures. However, validity and efficacy of cross education in rehabilitation have not been closely examined by well-controlled studies. Our current research aims to further study the above-mentioned issues.

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