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ABSTRACTS

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EXERCISE IN NEUROLOGICAL REHABILITATION: FROM EMPYRISM TO EVIDENCE-BASED RESEARCH

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A sound scientific approach to neurological exercise has pioneers among the neurologists of the 19th Century. They were looking at movement as a unitary phenomenon into which mechanical and neural aspects were interacting. An ideal thread is linking Duchenne, Foix, Jackson, Babinsky, Déjerine, Beevor. Jackson's concept of motor control as based on nested hierarchical levels along the central nervous system (reflexes, automatic reactions, voluntary motion) is still inspiring contemporary rehabilitation. In recent decades, his model was just enriched and made more flexible by the notion that "reflexes" are not stereotyped: rather, they can be "pre-set" according to intentions, expectations and learning. During the 20th Century, progresses in neurophysiology heralded by scientists such as Sherrington and Eccles made neurological research to shift towards cellular research and investigation of the nervous system from inside. Research on the mechanical and behavioural alterations of movement faded away. Yet, a few neurologists such as Temple-Fay, Denny-Brown, Brain, Twitchell were keeping alive a unitary neuro-mechanical vision giving support to exercise approaches such as those invented by Bobath and Kabat: the former focusing on inhibition of reflexes interfering with more complex actions, the latter emphasazing that properly evoqued reflexes may facilitate concurring voluntary movements. Until recently, intrinsic difficulties of trial design in behavioural research and poor functional imaging of the brain prevented any critical appraisal of these – and many other – techniques, which tended to become self-referenced and competing theoretical "systems". Things are now changing, due to progresses in: (a) the specific methodology in variable construction, trial design, and statistics [1]; (b) the new neurophysiological and imaging techniques allowing to explore

the brain activity during movement; (c) the advancing bioengineering of motion and dynamic electromyographic analysis. Exercise design, therefore, can follow more and more a bottom-up pathway. In the meanwhile, its effectiveness can be tested under valid paradigms lent from behavioural sciences. These can go beyond the assessment of local mechanical changes and encompass the measure of outcome [2] at whole-person and societal levels.

References

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