

ReGrasp

Clinical Research Summary

1. Therapeutic Electrical Stimulation (TES)

TES refers to cyclical exercise stimulation to increase muscle strength. *The ReGrasp hand stimulator delivers TES when in exercise mode.*

Clinical studies using TES have shown that:

- ***TES can significantly reduce hypertonus and improve motor function of the upper extremity*** (Baker et al. 1979; Waters et al. 1981).

The success rate in mild cases of stroke was lower than in severe cases. These conclusions were supported in a retrospective audit of patients at the Salisbury Stroke Unit in the UK (Taylor et al. 1996).

2. Functional Electrical Stimulation (FES)

FES refers to voluntarily-triggered stimulation to generate functional movement and/or assist in functional tasks. Regarding FES, in an exhaustive review of numerous studies world-wide, the Evidence-Based Review of Stroke Rehabilitation (EBRSR: www.ebrsr.com, (Foley et al. 2013)) concludes:

- ***“There is strong (Level 1a) evidence that FES treatment improves upper extremity function in acute stroke.”***
- ***“There is strong (Level 1a) evidence that FES treatment improves upper extremity function in chronic stroke.”***

In addition, an associated meta-study concluded that:

- ***Sensory and motor training with the use of imagery, electrical stimulation and the repetitive performance of novel tasks, could all be effective in reducing motor impairment after stroke*** (Barreca et al. 2003).

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This particular finding suggests that the use of ReJoyce and ReGrasp together is a superior technique for rehabilitation of the upper limb. Indeed, this has been supported in more recent studies (Gritsenko et al. 2004; Kowalczewski et al. 2007; Kowalczewski et al. 2010; Kowalczewski et al. 2011).

In relation to spinal cord injury, the Spinal Cord Injury Rehabilitation Evidence Project (SCIRE: www.scireproject.com) concludes:

- *“The use of [FES devices] appears to have a positive impact on pinch and grip strength and activities of daily life functions in C5-C6 complete tetraplegia, however, access to the devices is limited and they continue to be expensive in use.”*

A number of studies support this conclusion: (Alon and McBride 2003; Biering-Sørensen et al. 2015; Kapadia et al. 2013; Kapadia et al. 2011; Kowalczewski et al. 2010; Kowalczewski et al. 2011; Kowalczewski et al. 2007; Popovic et al. 1999; Popovic et al. 2011)

3. Commercially available upper extremity stimulators.

The first commercial upper extremity stimulator was the Automove, which detected weak voluntary activity of hand muscles and then electrically stimulated them to facilitate hand opening (Hansen 1979). Therapeutic effects were reported in controlled studies using this device (Cauraugh and Kim 2002; Chae 2003; de Kroon et al. 2005; Francisco et al. 1998; Heckmann et al. 1997).

More recent studies have shown that FES delivered with wearable electrical stimulators like the **ReGrasp**, combined with task-oriented exercises (such as **ReJoyce**), can result in clinically significant improvements in hand function in sub-acute and chronic stroke participants (Alon et al. 2008; 2007; Gritsenko and Prochazka 2004; Kowalczewski et al. 2007; Popovic et al. 2004; Popovic et al. 2005).

4. References

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