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Appraisal

Critically appraised paper: The addition of robotics with virtual gaming to rehabilitation for children with hand burns improves range of movement, grip strength and hand function

Synopsis

Summary of: Samhan AF, Abdelhalim NM, Elnaggar RK. Effects of interactive robot-enhanced hand rehabilitation in treatment of paediatric hand-burns: A randomized, controlled trial with 3-months follow-up. *Burns.* 2020;1347–1355.

Question: Does the addition of robotics with virtual gaming to hand rehabilitation improve finger range of movement, hand grip strength and function in children with hand burns? ***Design***: Randomised controlled trial with concealed allocation and blinded outcome assessment. ***Setting***: Outpatient clinic, Saudi Arabia. ***Participants***: Children aged 6 to 12 years with deep partial or full-thickness burns involving the wrist and hand, < 30% of total body surface area and who were recently discharged from inpatient care. Exclusion criteria were persistent burn-related respiratory difficulties, burn infection, exposed tendons, fractures and developmental disorders. Randomisation of 36 participants allocated 18 to the experimental and 18 to the control group. ***Interventions***: Both groups received education and hand rehabilitation delivered by physiotherapists and occupational therapists. This comprised outpatient rehabilitation for 60 minutes per session, thrice weekly for 2 months, which involved immersing the hand in paraffin, massage, range of movement and strengthening exercises. A home program was provided that comprised active and passive range of movement, scar management (including use of garments) and training to improve strength, dexterity and functional skills. In addition, the experimental group participated in an interactive robot-enhanced rehabilitation experience for 20 minutes after completing each traditional rehabilitation session. The robotic-assisted exercises were incorporated into virtual gaming targeting finger flexion/extension using force sensors. ***Outcome measures***: The primary outcome was total active range of movement in the fingers, defined as the sum of the active metacarpophalangeal, proximal interphalangeal and distal interphalangeal arc of motion of an individual digit, measured with a goniometer at the 3-month follow-up. Secondary outcome measures were changes in grip strength (hand-held dynamometer) and hand function (Jebsen-Taylor Function Test) after treatment (2 months) and at the 3-month follow-up. ***Results***: Thirty-three participants completed the study. At the 3-month follow-up, the total active range of movement for all fingers was greater in the experimental group: thumb 13 deg (95% CI 3 to 23); index 12 deg (95% CI 3 to 20); middle 11 deg (95% CI 2 to 21); ring 13 deg (95% CI 4 to 22); and little 11 deg (95% CI 2 to 21). Grip strength favoured the experimental group at 3 months by 3.5 kg (95% CI 0.6 to 6.5), as did hand function by −13.5 seconds (95% CI −3.2 to −23.9). ***Conclusion***: The addition of robotics with virtual gaming to rehabilitation for children with hand burns improves active finger range of movement, hand grip strength and function.

[95% CIs calculated by the CAP Editor.]

Provenance: Invited. Not peer reviewed.

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Commentary

Engaging children in therapy after burn injury can be challenging for therapists. It is acknowledged that novel approaches should be considered to aid compliance and improve the experience of rehabilitation.[1] Trauma-informed care for children recommends that potentially traumatic events, which can include therapy sessions, should be optimised to minimise distress to the patient and family.[2] Virtual reality and video games have been explored in children who have sustained burn injuries, and demonstrated increased engagement and enjoyment as well as pain reduction.[3,4] This study demonstrated that the addition of 20 minutes of robot-enhanced isolated hand rehabilitation improved finger range of motion, hand grip strength and hand function, which was maintained at 3 months. A longer follow-up period would be beneficial as scar formation, particularly in grafted wounds, peaks at 3 to 4 months.[5] The 3-month follow-up period may not have captured the period when scar tissue was thickest and more restrictive to range of motion. Further provision of details regarding skin type, genetic factors and time to wound healing would provide an insight into the risk of scar formation in the study participants and applicability of the study to wider populations.[6] With the use of specialty technology, consideration is required regarding whether the therapeutic gains are significant in relation to the time requirements for set-up.[7] Clinician access to robot-enhanced technology for rehabilitation is limited and a comparison between this intervention and other commercially available technologies would be interesting. Therapists should consider the ability to include functional activities when using technology-based rehabilitation for the potential translation into daily tasks.[4]

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