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Understanding Factors and Insights Influencing Manual Dexterity with Age, Expertise and Beyond: A Comprehensive Review

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ABSTRACT

Dexterity can be divided into manual dexterity and fine finger dexterity. It is an important skill required to perform daily living activities. For an individual to have good manual dexterity, there has to be intact musculoskeletal and neurological function and good eye-hand coordination. It is of paramount importance that the tools used for the assessment of hand function should have good validity and reliability so that they can provide accurate results and aid in rehabilitation. In this article, the authors have identified manual dexterity, grip strength, pinch strength, tactile acuity, and hand anthropometry as the significant factors contributing to hand performance. Full-text articles in English were gathered from various search databases. There is a need to see the influence of these factors on manual dexterity. The sensorimotor cortex of the human brain undergoes functional organisation with stimulation of the sensory system or learning of motor skills. Structural and functional changes in the brain usually occur with practice, learning, and expertise. With training, there is an alteration in the brain regions involved in planning and execution. It has been documented that the pinch strength, grip strength, and cutaneous sensation decline as age advances. From an in-depth literature search of the factors that affect hand performance, we can conclude that as age advances, cutaneous sensation and motor performance decrease in healthy individuals. However, whether the role of expertise and dexterity skills in occupations involving dextrous manipulation in adulthood can help preserve dexterity as one advances in age when no other underlying pathology exists is the area left unexplored. The potential of work-related activities as preventative measures for maintaining hand dexterity in adulthood is highlighted by research showing that consistent participation in activities requiring tactile feedback and fine motor skills may help prevent age-related decline in hand function. According to research on neuroplasticity, the brain maintains the capacity for adaptation through repeated skill-based practice, thus presenting opportunities for exploring whether occupational expertise in dexterity promotes anatomical or functional adaptations that alleviate the age-associated decrease in sensory and motor capabilities.

Keywords: Grip strength, Hand anthropometry, Pinch strength, Tactile acuity.