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Research Article

MULTIPURPOSE HAND STRENGTHINING TOOLS IN NEUROLOGICAL CONDITIONS

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Abstract

Hand functions are measured by using a range of standardised physical assessments and functional tests.Physical assessments include measuring the range of hand motion, strength, sensation, and physical dimen- sions of the hand. Functional tests aim to evaluate the coordination and fine dexterity of the hand while performing certain standardised tasks, as well as the functional sensibility.To examine the effects of finger-movement exercises and finger weight-lift training on handgrip strength and Activities of Daily Living. The combined use intervention with finger-movement exercises and proper finger weight-lift training improved the handgrip strength and ADLS values of very elderly individuals. These rehabilitation exercises may be used to help the elderly maintain their self-care abilities. Finger-movement exercises are traditionally used during the rehabilitation of hand functions, and interventions based on finger-movement exercises and finger weight-lift training have been accepted by older adults. We con- ducted our current study to evaluate the effects of finger- movement exercises and finger weight-lift training on the self-care abilities. We used our finger exercise and weight-lift baseline data to determine the long-term effects of these exercise methods on improving handgrip strength. Finger-movement exercises are commonly employed among peoples. These exercises are noninvasive and easy to apply in both an individual's home or a welfare institution. The combined use of finger-movement exercises and proper finger strength training can effectively improve handgrip strength and ADLS values. This approach could be used as a rehabilitation exercise to help the elderly maintain their self-care abilities as long as possible. Weight cuffs are also used to increase hand strength and help to achieve all the gross and fine grasp. Weight cuffs are also used as well as in lower extremity to increase muscle strength.

Keywords: Hand Strength, Grasp weight cuff, Hand grip, Hand fatigue rehabilitation, Stroke hand function.

INTRODUCTION

Neurological conditions are medically defined as conditions that affect the brain as well as the nerves found throughout the human body and the spinal cord. Structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms. Examples of symptoms include paralysis, muscle weakness, poor coordination, loss of sensation, seizures, confusion, pain and altered levels of consciousness.(1) We work together to ensure that the views and needs of people with all kinds of neurological conditions are heard by decision-makers. all neurological disabilities result from damage to the nervous system. Depending on where the damage takes place, determines to what extent communication, vision, hearing, movement and cognition are impacted.(2) Upper limb impairment is a common problem for people with neurological disabilities, affecting activity, performance, quality of life, and independence. Accurate, timely assessments are required for effective rehabilitation, and development of novel interventions. Patients with a systemic neurological disease can often first present with symptoms and signs affecting the hand.In the hand, the lower and combined motor neurone types may first present with wasting of the thenar muscles. Typically it is the abductor pollicis brevis (APB) muscle that is first to be affected.Subsequent to the weakening of the thenar muscles, the first dorsal interosseous (FDI) muscle is next affected.(3) This is referred to as the 'split hand' as the radial aspect of the hand is far more affected than the ulna aspect.The muscle atrophy eventually progresses proximally with diminished tendon reflexes.(4)

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Hand conditions may affect bones, muscles, tendons or other tissues of the hand. These conditions may be congenital (present at birth) or may develop later in life due to trauma, overuse or other causes.Hand conditions include, but are not limited to, fractures of the bones of the hand and wrist, hand arthritis, tendonitis, cysts and nerve compression, such as carpal tunnel syndrome. Various specialists may be involved in treatments of hand conditions, including physical and occupational therapists, oncologists, orthopaedic surgeons, plastic surgeons, neurosurgeons and other health care providers.Hand weakness can be a frustrating condition and is often caused by compressed nerves and damage to the tendons of the hand. Carpal tunnel syndrome is usually the cause of a weak grip. Other causes of weakness in hands include inflammation of the hand joints, a conditions known as tennis or golfers elbow, or an injury to the hand.Common characteristics of hand weakness(5).

Hand weakness can likely be described by the following.

Weak grip,Inability to carry otherwise manageable items, Numbness, Hand pain, Clumsiness using the hands, Hand fatigue.Between all the bones, joints, nerves, muscles, and ligaments, there is a lot of complexity in hands. The capabilities of the hand are also greatly influenced by connections to the arm and shoulder. The complexity of the hand allows it to do amazing things but also leaves it prone to issues. Our hands can also get rigorously tested throughout the day, resulting in even further health challenges.Many medical professionals analyze grip strength when assessing overall health. If the hands are weak, then there is the possibility that other, more serious, problems exist with overall health.Motor control capabilities are dictated by neurons. Hand weakness

ensues when a variety of syndromes known as neuron syndromes affect these neurons.[6] Occupational therapists use functional tasks, or daily occupations, to improve hand strength so that the clients they work with can lead functional lives: so they can have strong and efficient hands to do those tasks that take up their day.

METHODS

Observation studies were included in the review best on the objectives of the current review inclusion and exclusion criteria were prepared and based on that various data base was used in the selection of the study. The collected studies were checked for clarity and content and then used for the review.

Criteria for the sample collection

2-criterias, via inclusion and exclusion criteria were used for the collection of sample.

Inclusion criteria

- Participants with neurological conditions including hand impairment.
- Muscle strength < grade3
- Age group– Children, Adults
- Gender -Both male and female

Exclusion criteria

- Participants must not be >grade 3 MMT (according to manual muscle tasting)
- Participants with any physical deformity.
- Participants must not be having any inflammatory diseases
- Participants must not be having unhealed fracture, osteoporosis or postoperative Restrictions.
- Participants with seizure.

Data extraction and quality assessment

PRISMA flow diagram was used to select the articles eligibility criteria were assessed for extracted data included studies were evaluated on the basis of relevance appropriateness clarity and methodology. Those studies that were not meeting the criteria were included. Articles selected for review were assessed by two independence reviewer, the data extracted included participant, year of publication, study method, type of intervention and outcome.

Analysis

Steps in the analysis

Step 1 :- Obtain data were tabulated and classified as author, study design, year of publication, setting, method, sample, size, type of intervention, components of intervention and outcome.

Step 2 :- Identifying the findings of the studies. The studies were identifying with their setting, method and sample size, type of intervention and component of intervention.

Step 3 :- Categorising the findings, finding were categorised under the headings of the effect of enhanced occupational therapy intervention on the study the effect of participation in leisure and recreational activities on quality of life among patients with hand impairments.

1	Sarah Meyer, et.al	2021	Pilot Randomized Controlled Trial	18	post stroke	Conclusions: Results of this pilot RCT showed that an intensive, specific arm-hand BOOST program, on top of usual care, is feasible and safe in the sub-acute phase post stroke and suggests positive, clinical meaningful effects on upper limb function, especially when delivered in the early sub-acute phase post stroke.	It was the aim to assess feasibility, safety, and potential efficacy of a new intensive, focused arm-hand BOOST program and to investigate whether there is a difference between early vs. late delivery of the program in the sub-acute phase post stroke.
2	Paolo Milia Alessia et.al	2019	Hand Glove FES Device	8	Stroke (2 patients), Spinal Cord Injury (5 patients), and 1 patient affected by Multiple Sclerosis	The use of FES hand glove is feasible and easy to use in different neurological patients. Considering the general improvement, the reduction of spasticity can be reflected by an improvement of single aspects of daily living like feeding and transfers, ameliorating the life of our patients.	Severe neurological diseases are characterized by upper limb limitations especially related with motor weakness and spasticity. The aim of neurorehabilitation is increasing upper limb ability to help patients improving activities of daily living.
3	Jinsook Roh, et. al	2015	Multi-Axis Cartesian-based Arm Rehabili-tation Machine (MACARM)	24	stroke	results suggest that alterations in the shoulder muscle synergies underlying isometric force generation appear prominently in mild and moderate stroke, as in most cases of severe stroke, in an impairment level-dependent manner.	To Evidence for altered upper extremity muscle synergies in chronic stroke survivors with mild and moderate impairment
4	Vishnu Priya et.al	2015	Wrist weighing	21	CEREBELLAR LESIONS	Incorporation of wrist weighing along with conventional therapy reduced the intensity of upper limb tremors in patients with cerebellar injuries but both the treatments are effective in improving upper limb functions.	An intentional tremor is one of the most untreated causes in patients with cerebellar ataxia. Upper limb tremors decreases the performance of many activities of daily life Thus treatment of patients with tremor probably implies better functional ability. It is one of the major areas of concern to improve functional independence hence, this study proposed to know the effects of wrist weighing in reducing upper limb tremors in cerebellar injury patients.

5	Sarah Meyer,et.al	2014		10	Somatosensory Deficits	Large variation in results was found due to heterogeneity of the studies. However, somatosensory deficits were shown to have an important role in upper limb motor and functional performance after stroke	this study was to systematically review the available literature on the relationship between somatosensory impairments in the upper limb and outcome after stroke.
6	Xue-Ping Chen ,et.al	2014	finger-movement exercises and weight-lift training	80	Elderly	The combined use intervention with finger-movement exercises and proper finger weight-lift training improved the handgrip strength and ADLS values of very elderly individuals. These rehabilitation exercises may be used to help the elderly maintain their self-care abilities.	the effects of finger-movement exercises and finger weight-lift training on handgrip strength and Activities of Daily Living Scale (ADLS) values
7	Monique S. Ardon et.al	2013	Functional hand grip test	106	children with congenital hand differences (CHD)	The relation between body functions and manual activity capacity is stronger in non- dominant hands than dominant hands, indicating that improvement in body functions lead to larger changes in manual activity capacity in the non-dominant hand.	To evaluate manual activity capacity (i.e. activity capacity to perform hand activities) and its relation with body functions of the hand and forearm in children with congenital hand differences (CHD)
8	Stephen J. Page et.al	2012	Everest ran-domized controlled trial Fugl-Meyer Scale in People With Minimal to Moderate Impairment	146	hemiparesis	The estimated CID of the UE-FM scores ranged from 4.25 to 7.25 points, depending on the different facets of UE movement	This study used anchor-based methods to estimate the clinically impor- tant difference (CID) for the UE-FM in people with minimal to moderate impairment due to chronic stroke
9	Michaela A. Stoffer-Marx et.al	2012	randomised controlled trial	151	osteoarthritis	The combined one-session individual intervention significantly improved grip strength and self- reported satisfaction with treatment in patients with hand OA	The aim of this study was to evaluate the effect of a combined, interdisciplinary intervention feasible in both primary and specialist care compared to routine care plus placebo in patients with hand OA.
10	Carlyne Arnould et.al	2007	Box and Block Test Purdue Peg-board Test	101	children with cerebral palsy	Hand impairments and manual ability are not related in a predictable straightforward relationship. It is important that, besides hand impairments, manual ability is also measured and treated, as it is not simply the integration of hand functions in daily activities	To study hand impairments and their relationship with manual ability in children with cerebral palsy.

Conclusion

After studying the various articles related to studymultipurpose hand strengthining tools in neurological conditions. Reviewed article showed significant improvement in hand strength of person suffering from any neurological condition or hand impairment. The handgrip strength and ADLS values of people were enhanced by the combined use of intervention with finger-movement exercises, correct finger weight-lift training, the Box and Block Test by Purdue, and the Peg-board Test. Thus, we develop the finger hand strengthener instrument that is used in hand impairment. I advised using a multipurpose tool for hand and finger strengthening in order to improve hand grasp, hand strength, finger strength, isolated finger movement,strength. The impact of access to disability-related services on quality of life should be further investigated in the future, as well as how these associations may be influenced by contextual factors like socioeconomic status, family members' health, access to and participation in leisure activities, and the severity of the patient's needs.

so this systematic review is conducted to gather more evidences towards the improvement of hand strength and the tools developed will help in improving hand functions of patients.

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