

A systematic review assessing the effectiveness of hand therapy programmes in adults with burns using the International Classification of Functioning, Disability and Health framework

Akihito Yoshida^{1,2,3}, Michiro Yamamoto³, Cecilia W. P. Li-Tsang⁴,
Katsuyuki Iwatsuki³ and Hitoshi Hirata³

¹*Department of Prevention & Rehabilitation Sciences, Nagoya University Graduate School of Medicine, Nagoya, Japan*

²*Department of Rehabilitation, Nagoya University Hospital, Nagoya, Japan*

³*Department of Hand Surgery, Nagoya University Graduate School of Medicine, Nagoya, Japan*

⁴*Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong SAR, China*

ABSTRACT

This systematic review aimed to confirm the effectiveness of hand therapy programmes using the International Classification of Functioning, Disability and Health framework for each of the three phases of the wound healing process in adults with burns. A systematic review was conducted to determine the efficacy of different hand therapy programmes in the management of burnt hands. Two independent reviewers conducted a literature search using the PubMed and Cumulative Index to Nursing and Allied Health Literature databases for original articles reporting effectiveness of hand therapy programmes for adults with burns. Only randomized and non-randomized controlled trials were selected using the Mixed Methods Appraisal Tool. Demographic and clinical data including medical history, burn depth, and hand therapy programme were extracted. Outcome measures were reviewed based on the International Classification of Functioning, Disability and Health framework for acute, convalescence, and chronic phases of rehabilitation. Sixteen articles and 15 hand therapy programmes were identified, which included studies showing improvements in different parameters in the framework. In the acute and convalescence phases, improvements were found in health condition, body functions and structures, activities, and participation. In the chronic phase, improvements were shown only in body functions and structures. Environmental factors in the framework were not reported for all the phases. This review demonstrated the efficacy of hand therapy programmes in adults with burns in terms of the health condition, body function, activities, and participation during acute and convalescence phases but only the body function in the chronic phase.

Keywords: burns, hand therapy, rehabilitation, systematic review, upper extremity

Abbreviations:

ICF: International Classification of Functioning, Disability and Health

RCT: randomized controlled trial

QOL: quality of life

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-analyses

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Corresponding Author: Akihito Yoshida, PhD

Department of Integrated Health Science, Nagoya University Graduate School of Medicine,

1-1-20 Daiko-minami, Higashi-ku, Nagoya 461-8673, Japan

TEL: +81-52-719-1371, Fax: +81-52-719-1371, E-mail: yosh.akhito@met.nagoya-u.ac.jp

CINAHL: Cumulative Index to Nursing & Allied Health Literature

TBSA: total burn surface area

MMAT: Mixed Methods Appraisal Tool

ROM: range of motion

MCP: metacarpophalangeal

AROM: active range of motion

PIP: proximal interphalangeal

PROM: passive range of motion

TENS: transcutaneous electrical nerve stimulation

ADL: activities of daily living

IQR: interquartile range

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INTRODUCTION

The importance of rehabilitation of adults with burn injuries is increasing.¹ Rehabilitation of hands and upper limbs is the most common of all body parts, because these body parts are typically the most affected by burns.² Although many systematic reviews on the effectiveness of intervention are reported, such studies on the comprehensive understanding of the effect on a person's life is needed to facilitate best practices and identification of any remaining challenges.³

The International Classification of Functioning, Disability and Health (ICF) framework is a globally accepted framework that classifies rehabilitation. This classification considers several parameters such as (1) health condition; (2) body functions and structures, including physical and psychological functions; (3) activities of individuals, including walking, eating, toileting, dressing, grooming and bathing; (4) participation in social life, including working, housework and leisure activity; (5) personal factors; and (6) environmental factors, including tangible and intangible factors such as family structure, house structure and key person who supports the patient. These components, except the personal factors, can be classified to provide a standardized and common understanding and description of health and health-related status.⁴ ICF comprehensively integrates different rehabilitation approaches.⁵

Wound healing process is considered when deciding on hand therapy interventions. A randomized controlled trial (RCT) for burnt hands analysed the effect of rehabilitation in three phases (before, during and after basic wound healing).⁶ Moreover, the effectiveness of hand therapy programme needs to be examined according to the wound healing process and ICF classification. This systematic review summarized the effectiveness of different hand therapy programmes in adults with burns using the ICF framework of outcomes in the three phases. We hypothesized that there is evidence on the effectiveness of rehabilitation programmes in all phases, in terms of the quality of life (QOL) (health conditions), body functions and structures, activity, participation, and environmental factors, in the ICF framework.

METHODS

Protocol and registration

We conducted a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement.⁷ The PRISMA statement comprises a minimum set of 27 items and a flow chart. The systematic review team members included occupational therapists, hand surgeons, and orthopaedic surgeons.

Selection criteria

An extensive literature search was conducted to identify publications reporting on the effectiveness of hand therapy among adults with burns. We searched the publications accepted up to 2019 using the PubMed and Cumulative Index to Nursing & Allied Health Literature (CINAHL) databases. The medical subject headings used for the search were 'burns' AND 'rehabilitation' OR 'hand therapy'.

All identified full-text articles were independently screened by two reviewers (AY and MY). Then, the reference lists of the selected articles were examined to identify additional potential articles. The inclusion criteria were applied to identify studies that (1) were RCTs and non-RCTs showing the evidence of the result using statistical analysis; (2) included patients aged 18 years or older, with burns on the upper extremity, hand and finger; (3) reported on hand therapy programmes, occupational therapy or physiotherapy; and (4) reported quantitative outcome measures based on body function, activity, participation and environmental factors in ICF. The following exclusion criteria were applied: (1) case report; (2) case series as descriptive research; (3) review; (4) non-English articles; (5) studies that included young patients (< 18 years); (6) outcomes including the face, trunk or lower extremity; and (7) outcomes unrelated to the upper extremity, hand and finger (eg, outcomes of respiratory or cardiac function).

Data extraction and synthesis

Two reviewers (AY and MY) independently extracted the characteristics of the included studies using a standardized data form developed for this review. Data were extracted by the first reviewer on the list of journals, year of publications, country, study design and sample size as characteristics of included studies. Mean age and sex were extracted as demographic data. Side of the hand affected, burn depth, total burn surface area (TBSA) and post-burn time from injury to starting rehabilitation were extracted as burn-related data. Our outcomes of interest were the effectiveness of hand therapy programmes for each health decondition, dysfunction, activity limitation and participation restriction based on ICF. Thus, therapy programmes, treatment goal (target of treatment), period of intervention, frequency of intervention, intensity of intervention, outcome and *p*-value in the control and intervention groups were extracted. Data were synthesized according to principles of meta-ethnography to synthesise data.⁸ Results were presented in narrative form because it was not possible to perform a meta-analysis due to the heterogeneous study design and use of outcome measures. Finally, we summarized each programme in terms of quality of study, interventional phase, interventional period, improved outcome and unimproved outcome. Interventional phase was classified into acute (within 3 days after injury), convalescence (3 days to 4 weeks) and chronic (more than 4 weeks) phases because basic wound healing started from approximately 3 days after injury and lasted 4 weeks.⁶ Additionally, main objectives of interventions were surveyed in each article.

Assessment of methodological quality

The methodological quality of the studies was evaluated using the Mixed Methods Appraisal Tool (MMAT).⁹ MMAT is a reliable and valid instrument assessing the methodological quality of studies with various designs. This tool maintains robust consistency among reviewers (intraclass correlation = 0.72).¹⁰ We used the tool revised in 2018, which had five core criteria to evaluate the methodological quality in each study design.⁹ Each criterion was graded as 0 (unmet) or 1 (met), and the total score of each study was calculated from 0 to 5 (0=no criterion satisfied, 1=satisfied one criterion, 2=satisfied two criteria, 3=satisfied three criteria, 4=satisfied four criteria, 5=satisfied all five criteria). The methodological quality of studies was scored using percentage (0–100%). When any disagreement occurred, the review authors (AY and MY) discussed to

reach final agreement.

After assessing the methodological quality, we summarized the effects of hand therapy programmes using the ICF framework in the three phases. Included hand therapy programmes were described in each parameter in the ICF framework. The amount of the effectiveness of programme in each parameter was indicated by the fraction, namely, the number of studies reaching significant treatment effects over the total number of studies evaluating the effectiveness of the intervention on that specific outcome measures.⁵ Finally, we tested our hypothesis based on whether more than half of the described fraction or not in each parameter in the ICF framework was observed.

RESULTS

Study flow through the review

Overall, 3,969 studies were selected from the PubMed and CINAHL databases. After duplicate removal, 3,956 studies were screened, and 2,210 studies were excluded after screening the titles and abstracts. The remaining 1,746 articles were recognized as potentially relevant and were retrieved to evaluate the full text. Of these, 1,730 studies were excluded and 16 were finally included in this systematic review (Fig. 1).^{2,6,11-24}

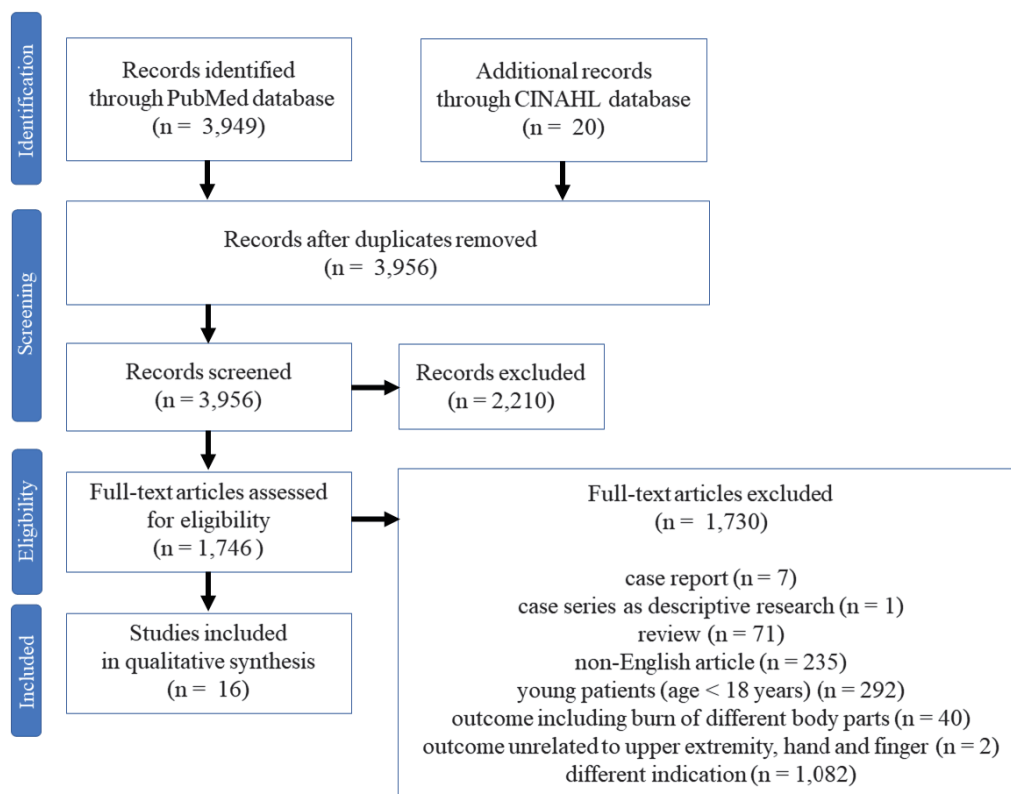


Fig. 1 Screening process of publications

Characteristics of the selected studies

The studies were reviewed based on their characteristics. All the included studies were published after the year 2004. Of the included studies, seven were from South Korea, three from the US, two from Australia, and one each from India, France, China, and Turkey.^{2,6,11-24} Of the 16 studies, 10 and six studies were designed as RCT and non-RCT, respectively.^{2,6,11-24} Most sample sizes for the included studies were in the range of 10–60, except for one study that had 146 participants.

Demographic and burn-related data of included studies

Demographic and burn-related data are summarized in Table 1. The mean ages were in the 30s, 40, and early 50s in four (one study described a median), eight and one study, respectively.^{2,6,11-13,16,17,19,21-24} One study reported the age range of patients from 20 to 50 years.¹⁴ There was no description of the mean age in two studies.^{15,20} Twelve studies had more male participants than female participants. One study had more female participants than male participants.²³ Three studies did not describe the sex of participants.^{14,15,20} Of the included 16 studies, 12 did not report the side affected.^{11,12,14-18,20-24} A few studies described the affected hand as 'right, left or both' and 'dominant, non-dominant or both'.^{2,6,13,19} The mean TBSA reported was between 12.0% and 37.3%, except for four studies with ambiguous or no descriptions.^{14,15,20-22} The burn depth was confirmed to be IIs, IId and III degrees. The post-burn time from injury to starting rehabilitation was within 2, 3, 4, 10, 30, 56, 84, 90,105, 127, and 148 days, as well as 6 months, in that order.^{2,6,11-24} In two studies, there was no description of post-burn time, but the participants were reported as inpatients and outpatients in each.^{16,19}

Quality assessment

The initial agreement between the two reviewers was 90.0%. Unmet criteria were missing descriptions of appropriate randomisation, incomparable data between groups at baseline, high dropout rate (20% or more), lack of assessor blinding and no description of confounders.^{2,6,11-24} Regarding the total score, score of five was observed in one study.¹⁷ Scores of four and three were observed in 11 and three studies, respectively.^{2,6,11-16,18,19,21-24} Score of one was observed in one study.²⁰ Two RCTs used sham instrument that was visually identical to the active unit.^{13,14,18} Other RCTs did not use patient-blinded study designs.

The items judged as 'unmet' in the RCTs were the missing descriptions of the allocation, the incomparable between groups at baseline and the 20% or more dropout, the unblinded assessor.^{6,11-13,18-20,22-24} The items judged as 'unmet' in non-RCTs were the 20% or more dropouts and the consideration of confounding factors.^{2,14-16,21-23} For the quality of studies, scores of five, four, three and one out of five points were assigned in one, 11, three and one study, respectively.^{2,6,11-24} In the RCT studies, two studies achieved blinding of the patients with sham treatment tools that were not functional.^{18,20} Other RCTs did not use patient-blinded designs.^{6,13,17,19,22,23}

Efficacy of interventions

We summarized the effectiveness of hand therapy programmes in each study. Conventional rehabilitation improved all QOL domains.⁶ Shoulder abduction orthosis increased the range of motion (ROM) of the shoulder flexion and abduction, but not external rotation.¹⁷ Another reported shoulder abduction orthosis, decreased pruritus duration, degree, direction, intensity and consequence, but not the disability due to pruritus and its frequency.¹⁹ Dynamic metacarpophalangeal (MCP) joint flexion orthosis improved active ROM (AROM) and hand function (Michigan Hand Outcomes Questionnaire), but not grip strength, hand function (Jebsen Hand Function Test and Functional Independence Measure) and QOL.¹³ Hand compression bandage improved ROM of the

Table 1 Demographic and burn-related data for the intervention group

Reference No.	Mean age (y.o.)	Male: Female (n)	Side affected (n)	TBSA (%)	Burn depth (degree)	Post-burn time
6	35.5 ± 12.6	26:4	D17:Both13	15.8 ± 18.6	II 8, III 22	Within 3 days
17	43.5 ± 10.4	9:2	Not clear	32.9 ± 21.9	II 3.1%, III 5.3%	Within 30 days
19	49.4 ± 19.0	19:8	D12:ND15	18.6 ± 10.6	IIs 10, IId 13, III 4	Not clear (inpatients)
13	39.5 ± 11.2	18:3	R5:L2:Both14	27.6 ± 23.6	IId 0.5%, III 2.8%	105.6 ± 49.3 days
2	45.9 ± 8.5	18:4	R13:L9	31.9 ± 19.9	Not clear (at least IId or III)	Within 3 months
20	Not clear	Not clear	Not clear	Not clear	Not clear	Not clear
23	51.0	2:3	Not clear	25.5	Not clear	6.4 months
11	46.1 ± 8.6	61:15	Not clear	37.3 ± 18.6	Not clear	148.8 ± 56.9 days
21	33.3 ± 8.3	14:4	Not clear	Not clear	IId 2, III 16	127.6 ± 171.1 days
15	Not clear	Not clear	Not clear	Not clear	Not clear (at least IId or III)	Within 2 days
14	20.0-50.0 (range)	Not clear	Not clear	Not clear (at least less than 60%)	Not clear (at least IId or III)	Within 10 days
24	31.0 (median)	10:5	Not clear	5.0 (median)	I 2, II 13	4.0 days (median)
16	49.0	6:3	Not clear	12.0	Not clear (at least II or III)	Not clear (outpatients)
22	44.2 ± 10.6	10:4	Not clear	Not clear	II 2, III 12	1-3 months
12	42.5 ± 13.7	16:4	Not clear	23.3 ± 15.0	Not clear	56.1 ± 21.7 days
18	45.4 ± 13.8	17:6	Not clear	20.9 ± 15.2	Not clear (at least II or III)	84.2 ± 58.6 days

The leftmost column are the reference numbers.

TBSA: total body surface area

y.o.: year old

MCP joint in all fingers, circumference of hand, skin thickness and pain intensity, but not ROM of the proximal interphalangeal (PIP) joint in all fingers, grip strength and hand function.² Silon-applied positive pressure glove improved hand function in terms of the average time and average ability, although it categorized the fine and gross motors separately.²⁰ Soft tissue mobilisation did not increase ROM of the wrist joint and burn scar.²³ Massage therapy decreased pain intensity, pruritus intensity and scar thickness.¹¹ Another paper reported massage therapy improved pruritus intensity, burn scar, skin status and depression.²¹ In the study, interventions improved pigmentation in subjective skin status, but not pigmentation in objective skin status, using the Vancouver Scar Scale. Motor imagery increased ROM.¹⁵ Physical rehabilitations, including positioning, aeroplane orthosis, stretching, passive ROM (PROM) and AROM, increased flexion, abduction and external rotation of the shoulder joint.¹⁴ Xbox™ Kinect improved mean daily activity time, but not upper extremity function, pain intensity and kinesiophobia.²⁴ Transcutaneous electrical nerve stimulation (TENS) decreased pruritus intensity.¹⁶ Laser treatment improved pain intensity and PROM, but not pressure sense.²² Ultrasound treatment improved pain intensity and pressure sense, but not the PROM.²² Matrix rhythm treatment improved pressure sense and PROM, but not pain intensity.²² Extracorporeal shock wave therapy decreased pain intensity, threshold and frequency.¹² Another paper reported extracorporeal shock wave therapy decreased pruritus intensity.¹⁸

Table 2 shows the summary of the effectiveness of each hand therapy intervention with 15 hand therapies found. Of the 15 interventions, four, seven, and two interventions involved the acute, convalescence and chronic phases, respectively.^{2,11-15,17-24} The phases of two interventions were unclear.^{16,20} The period of intervention ranged from 10 days to 3 months. Twelve hand therapy programmes showed improvements of QOL (comprehensive health and general health condition) in health condition of ICF and pain; pruritus; skin status, burn scar; hand circumference; ROMs of the shoulder flexion, shoulder abduction, shoulder external rotation, wrist and thumb joints and MCP joint; hand function; depression; and QOL (physical and psychological functions) in the body functions and structures of ICF (fine motor activities of daily living [ADLs], gross motor and daily activity time in the activity of ICF); and QOL (social function) in ICF.^{2,6,11-22,24} In contrary, some interventions did not show significant improvements of QOL in health condition of ICF and pain; pruritus; pressure sense; burn scar; ROMs of the shoulder external rotation, wrist and PIP joint; grip strength; kinesiophobia; hand and upper extremity functions in the body functions and structures of ICF; and degree of ADL independence in activities of ICF.^{2,11-24} Targets of treatments as the main objectives of interventions included the deterioration of comprehensive status (conventional rehabilitation); contracture of the shoulder joint (shoulder abduction orthosis); MCP joint extension contracture (dynamic MCP joint flexion orthosis); hand oedema (hand compression bandage); difficulty of performing daily tasks (positive pressure glove); contracture and hypertrophic scar (soft tissue mobilisation); hypertrophic scar (massage therapy); depression (massage therapy); motor dysfunction (motor imagery); shoulder joint contracture (physical rehabilitation); activity limitation, upper extremity dysfunction and pain (Xbox™ Kinect); pruritus (TENS); contracture, upper extremity dysfunction, decline of local circulation, hypertrophic scar and pain (laser treatment, ultrasound treatment and matrix rhythm therapy in common); and scar pain (extracorporeal shock wave) and scar pruritus (extracorporeal shock wave).^{2,6,11-24} Among 16 studies, 14 targeted the domain of body function in ICF.^{2,11-23} Two studies targeted domains of health condition and activities in ICF for the intervention, respectively.^{6,21,24}

Table 2 Identified hand therapy programmes and their effects

Reference No.	Quality of study ^a	Intervention			Outcome		
		Programme	Phase	Target of treatment	Period	Improved	Unimproved
6	4/5	Conventional rehabilitation ^a	Acute to convalescence	Deterioration of comprehensive health status	5 weeks	QOL Comprehensive health Physical function Psychological function Social relation General health	None
17,19	5/5, 4/5	Shoulder abduction orthosis	At least convalescence to chronic	Contracture of shoulder joint	4–12 weeks	AROM (shoulder flexion and abduction at 4 weeks) AROM (shoulder at 12 weeks) Upper extremity function QOL	AROM (shoulder external rotation at 4 weeks) AROM (shoulder at 12 weeks) Upper extremity function QOL
13	3/5	Dynamic MCP joint flexion orthosis	Chronic	Extension contracture of the MCP joint	8 weeks	AROM (MCP joint) Hand function	AROM (PIP joint) Hand function Degree of ADL independence QOL
2	4/5	Hand compression bandage	Not clear	Oedema of the hand	4 weeks	ROM (MCP joint) Circumference of the hand Skin thickness Pain intensity	ROM (PIP joint) Grip strength Hand function
20	1/5	Positive pressure glove	Not clear	Difficulty of daily tasks	10 days	Hand function Fine motor Gross motor	None
23	4/5	Soft tissue mobilisation	Chronic	Contracture and hypertrophic scar	Not clear	None	ROM (wrist) Burn scar Pliability Vascularity

11,21	4/5 4/5	Massage therapy	Convalescence to chronic	Hypertrophic scar, ²³ Hypertrophic scar and depression ³³	1–3 months	Pain intensity Pruritus intensity Scar Thickness Melanin Erythema TEWL Elasticity Pigmentation Pliability Vascularity Size Dryness Depression	Scar Sebum level Pigmentation
15	3/5	Motor imagery	Acute	Motor dysfunction	2 weeks	ROM (thumb and wrist)	None
14	4/5	Physical rehabilitation**	Acute to chronic	Shoulder joint contracture	6 weeks	ROM (shoulder) Flexion Abduction External rotation	None
24	4/5	Xbox Kinect™	Acute to convalescence	Activity limitation, upper extremity dysfunction and pain	Maximum 1 week	Daily activity time	Upper extremity function Pain intensity Kinesiophobia
16	3/5	TENS	Not clear (outpatients)	Pruritus	3 weeks	Pruritus intensity	None
22	4/5	Laser treatment	Chronic	Contracture, upper extremity dysfunction, decline of local circulation, hypertrophic scar and pain	3 weeks	Pain intensity	Pressure sense PROM
22	4/5	Ultrasound treatment	Chronic	Same as above	3 weeks	None	Pain intensity Pressure sense PROM

22	4/5	Matrix rhythm treatment	Chronic	Same as above	3 weeks	Pressure sense	Pain intensity PROM
12,18	4/5,4/5	Extracorporeal shock wave therapy	convalescence	Scar pain, ²⁴ Scar pruritus ³⁰	3–4 weeks	Pain Intensity Threshold Frequency Pruritus Intensity Consequences Direction of improvement	Pruritus Frequency Degree Duration Disability

*The friction as score indicates the calculated score over the total score in the Mixed Methods Appraisal Tool (MMAT).

*ROM exercise, ADL training, patient education and psychological support for motivation to treatment.

**Positioning, shoulder abduction orthosis, stretching exercise, passive ROM and active ROM.

The numbers in the leftmost column are the reference numbers of the 16 citations.

TENS: transcutaneous electric nerve stimulation

ADL: activities of daily living

PROM: passive range of motion

AROM: active range of motion

MCP: Metacarpophalangeal

PIP: proximal interphalangeal

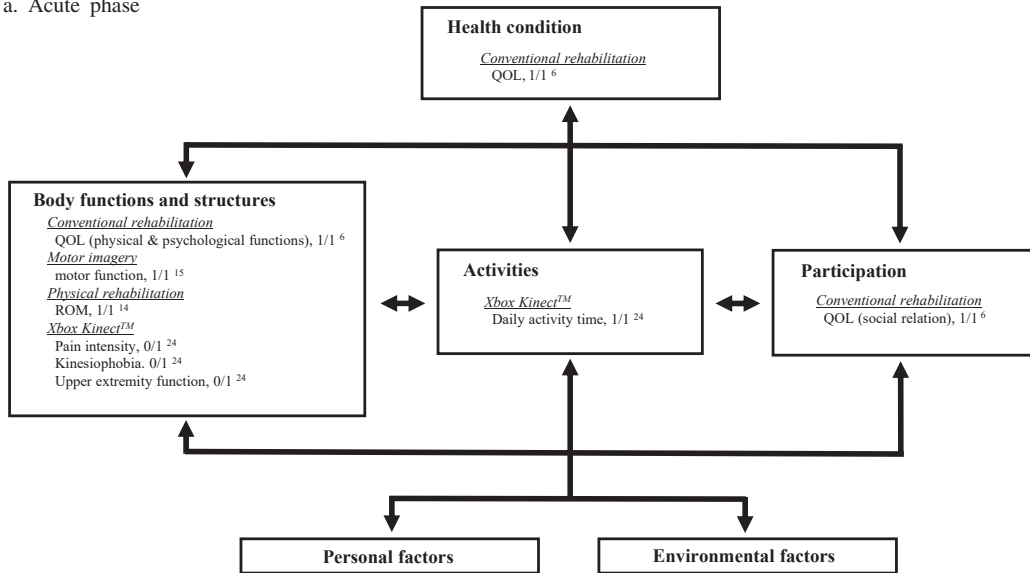
QOL: quality of life

ROM: range of motion

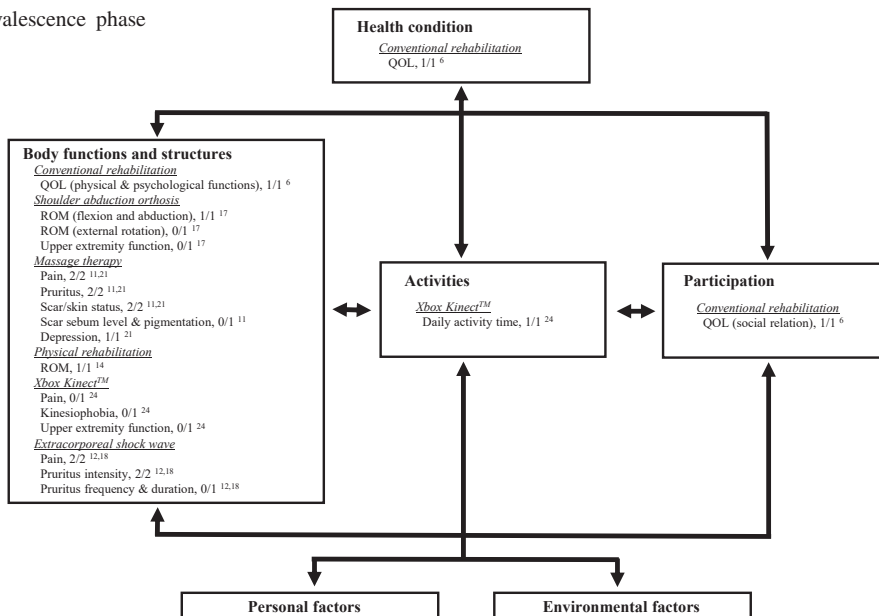
TEWL: transepidermal water loss

The evidence for testing our hypothesis is provided in Fig. 2. The efficacy of therapeutic programmes was classified by disease stages using ICF (Fig. 2) with exception of both positive pressure glove and TENS because of their unidentifiable stage of disease.^{16,20} In acute and convalescence phases, health condition, body functions and structures, activities and participation in ICF domains had effective outcomes. In contrary, body functions and structures of both stages showed that pain intensity, kinesiophobia and upper extremity function were not improved by some programmes (shoulder abduction orthosis and Xbox Kinect™) (Fig. 2a and b).^{17,24} None

a. Acute phase



b. Convalescence phase



c. Chronic phase

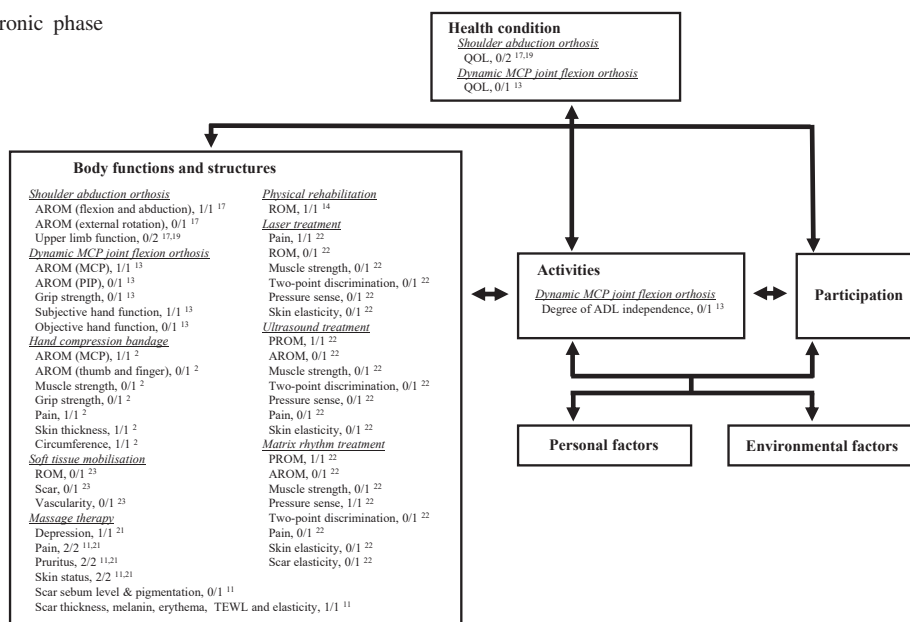


Fig. 2 Diagram of the efficacy of therapeutic programmes on issues classified by the International Classification of Functioning, Disability and Health framework

Fig. 2a–c: The efficacy of hand therapy was divided by the stages of disease: (a) acute phase, (b) convalescence phase and (c) chronic phase. The positive pressure globe²⁰ and transcutaneous electrical nerve stimulation¹⁶ were not described in this diagram because the interventional phase was unknown.

The ‘number/number’ indicates the number of studies reaching significant treatment effects vs the total number of studies evaluating the effect of the intervention on that specific parameter.

- ADL: activities of daily living
- AROM: active range of motion
- MCP: metacarpophalangeal
- QOL: quality of life
- ROM: range of motion
- TEWL: transepidermal water loss

of the included studies confirmed environmental factors in hand therapy programmes in both stages. In chronic phase, body functions and structures in ICF showed that many programmes could improve physical functions, including PROM, AROM, paraesthesia, skin condition and hand function, whereas PROM, AROM, pain intensity and hand function were not improved in some programmes. However, the effectiveness of the treatment on health condition and activities was not shown. None of the studies tested the effectiveness of hand therapy programmes in participation and environmental factors of the ICF domains (Fig. 2c).

DISCUSSION

This systematic review revealed that hand therapy programmes are effective for body functions

and structures in ICF including psychological status from acute to chronic phases. Additionally, activity and participation improved at acute and convalescence phases.

Quality as interventional study

Of the 16 articles, 15 reached good appraisals (MMAT met at least 60% of the criteria). In contrary, one article showed low study quality.²⁰ We should interpret the effectiveness of positive pressure glove as existing with high risk of bias. In contrast, the strength of the article included the use of patient-blinded design, although this was not included in the criteria. Results of such well-blinded trials are more likely to be valid than results of trials in which participants could easily determine which intervention they received.²⁵

Demographic and burn-related data

The mean or median ages ranged from 31.0 to 51.0 years (Table 1). Among the sex ratio in most articles, males were two to four times more than females. An epidemiology of adults with burn injury reported that the median age was 46.0 (interquartile range [IQR], 35–60) years, and 74% of patients were male.²⁶ The TBSA ranged from 5.0% to 37.2%, and the degree of burn depth was mostly II or III (Table 1). Epidemiological studies showed that the median TBSA was 35% (IQR, 25–45).²⁶ Therefore, our included articles were representative of adults with burn injury. Moreover, we demonstrated that hand therapy services were delivered to severe burn injury. The physical and psychological impairments resulted in prolonged productivity loss among middle-aged patients.²⁷

Summary of therapeutic interventions

In the acute phase, we showed that conventional rehabilitation, physical rehabilitation, and motor imagery were effective for motor function and QOL. Xbox Kinect™ improved daily activity time, but not pain intensity, and negatively affected body functions and structures of ICF. Using Xbox Kinect™, the type of game was selected by therapists to move joints involved due to the location of injury. For improving pain intensity and fear of movement, we suggest that the choice of game is selected by patients because of cognitive restructuring for changing dysfunctional schemata that result in biased information processing and increased symptomatology.²⁸ In the convalescence phase, conventional rehabilitation, physical rehabilitation and Xbox Kinect™ use were effective. Moreover, massage therapy and extracorporeal shock wave therapy were effective for pain, pruritus, skin status and depression. Hypertrophic scar development is a common occurrence after burn with reported incidence of up to 77%.²⁹ The presence of hypertrophic scar is associated with further increased pain intensity, pruritus and psychosocial impairments with disfiguring conditions, potentially limiting patients' return to their pre-morbid ADLs.³⁰⁻³² We suggest the beneficial effect of massage therapy and extracorporeal shock wave therapy on these critical issues. In the chronic phase, we suggest that orthosis therapy is the most effective approach for preventing and improving soft tissue stiffness because the treatment possibly allows for the long-lasting stretching of targeted tissues even when therapists are absent.

Notably, conventional rehabilitations, including ROM exercise, ADL training, patient education and psychological support for motivation to treatment during acute and convalescence phases, significantly improved comprehensive, physical, psychological, social relation and general health conditions.⁶ Therefore, the intervention can be considered a standard treatment for adults with burn injuries. When patients experience clinical problems addressed individually despite undergoing conventional rehabilitation, the ICF framework provides additional treatment plans for these problems.

Study limitations

Although this systematic review provides novel information about the effectiveness of hand therapy programmes in adults with burns, the findings should be interpreted considering several limitations. First, only reference lists within relevant articles were scrutinized, and other possible articles may have been missed in electronic searches, which may introduce a reference bias. However, the possibility of the bias was overcome by selecting two databases specialized in the fields of medicine and health science. Second, our findings are based on studies with a wide variety of methodological qualities. Thus, these should be interpreted with caution in terms of generalisability. Tertiary, our review did not include the quantitative systematic review and meta-analysis for specific interventions because, as mentioned at the beginning, this review aimed to identify the efficacy of rehabilitation programmes in adults with burns using a systematic review. Finally, our findings may not be applicable to the elderly with burns because the mean ages in included articles were from thirties to forties. The elderly is not only a high-risk population for burn injury but also its neurological sequela. This risk, at least in part, reflects multiple factors: age-related changes in the central and peripheral nervous system; multiple pre-existing co-morbidities (such as dementia and chronic obstructive pulmonary disease); polypharmacy; suboptimal social support; and increased susceptibility to hypothermia, burn-related infections, and electrolyte and metabolic dysregulations.³³

CONCLUSION

This systematic review demonstrated that hand therapy programmes including conventional rehabilitation substantially contributed to improve burn-related issues in adult patients with burn. The programmes showed efficacies in terms of health condition, body functions and structures, activities and participation in the ICF framework at acute and convalescence phases. At the chronic phase, the programmes certified only one domain of body functions and structures. Through all phases, environmental factors were not reported in any study. In the future, hand therapists need to investigate the effectiveness of therapeutic programmes on health condition, activities and participation in ICF domains in the chronic phase and environmental factors in acute, convalescence and chronic phases. In conclusion, this systematic review demonstrated the efficacy of hand therapy programmes in adults with burns, mainly in acute and convalescence phases. We believe that this review will allow clinicians to improve the clinical outcomes of adult patients with burn injuries.

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All authors attest that they meet the current International Committee of Medical Journal Editors criteria for Authorship.

DISCLOSURE STATEMENT

There are no competing financial disclosures. The authors declare that they have no conflict of interest.

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