



A literature review of modified constraint-induced movement therapy (mCIMT) as an effective intervention in improving the paralytic upper limb of stroke survivors.

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PREAMBLE:

Stroke is an acute condition where the blood supply of the brain is hampered due to hemorrhagic or ischemic pathology. Stroke/ Cerebrovascular accident is one of the leading causes of death and disability among survivors. This condition is the third cause of death after cardiac arrest and cancer, where the prevalence is 55,6 per 100,000 of all ages (Dalal 2007). 1,6 million cases were reported in India in 2015 and it is said that one-third of them were disabled. Most post-stroke patients develop contra-lateral hemiplegic (weakness of opposite side upper limb and lower limb). Physiotherapists are exploring more and more effective techniques for improving motor deficits among these hemiplegics. As per American Heart Association, about 88% of stroke occurs due to ischemic pathologies.

Developing countries need to explore interventions that are easy to apply and cost-effective for such patients so that they can address the mounting number of stroke cases and reach remote areas. Some of these hemiplegic patients shall develop a little improvement even without proper therapy, but shall land up in a situation known as “learned non-use”. This is a situation explained by Dr. Edward Taub, who detailed the behavioral abnormality of the patient to overused the non-affected side to compensate for the

functional limitations due to the paralytic upper limb and lower limb. The patient then shall have poor interest in the rehabilitative approach and so in the recovery. Chronic stroke patients who shall develop such situations are a big challenge for therapists.

Dr. Edward Taub designed a new approach to overcome this phenomenon of “learned non-used”, Constraint Induced Movement Therapy. He had experimented by limiting the movement of the sound limb and intense rehabilitation of the affected side. The study showed that the experimental group had responded significantly with improvement in all objective measures (Taub et al, 1993). Further research had also approved the significance of Constraint-Induced Movement Therapy as an effective tool. Studies have shown that this helped in modelling the behavior during motor training. This is also proved effective in promoting cortical plasticity in the cortical region of the paretic arm after the CIMT intervention (Liepert et al 1998, 2000). CIMT is also proven effective in conditions like Traumatic Brain Injury, Hemiplegic Cerebral Palsy, Spinal Cord Injury, Parkinson’s disease, Disseminated Sclerosis, etc.

The parameter of CIMT is not well defined and the intensity of the best training during the period is not certain. Often patients also complain about the severity of the training and prolonged the duration of constrain. Accordingly, this turned out to be a practical difficulty among hemiplegic children. So had called many critics among Physiotherapists (Sakzewski et al 2009). Thus, Modified Constraint Induced Movement Therapy (mCIMT) is developed as a substitute for CIMT. There are 02 known parameters for the mCIMT as per various practitioners. The first approach suggests of duration of less than 6 hours of constraining per day with 30 minutes to 3 hours of intense rehabilitation, for 2-10 weeks. The second style promotes intense task-oriented training for 30 minutes for three times/week, over 20 weeks. In short, these methods support less constraint and so reduce the

harshness of the training style. mCIMT is said to be effective in improving arm function, gait and balance.

This literature review is projected to discover the possibilities of mCIMT in overcoming the patriotic arm of post-stroke patients. The objective is also to explore the parameters and mode of application of mCIMT in an introductory course. The review shall promote further possibilities of randomized control trial and/or systematic review and meta-analysis. This pilot review shall also investigate the stage of stroke, i.e., acute, sub-acute, or chronic; that shall respond better with mCIMT protocol.

OBJECTIVE OF THE STUDY:

- To compare various studies on the effectiveness of modified Constrained Induced Movement Therapy (mCIMT) over conventional Physiotherapy interventions for patients with upper-limb impairment post-stroke.
- The study shall also evaluate the effect of modified Constrained Induced Movement Therapy on improving the functional impairment of medically stable stroke patients in the sub-acute and chronic phases.
- To identify the key parameters for the effective modified Constraint Induced Movement Therapy (mCIMT).
- To summarize the findings in such a way that cost-effective interventions shall be constructive in the prompt recovery of impairments in Hemiplegics.
- The study objective is also to keep groundwork for further randomized control trials, systematic reviews, and/or meta-analysis.

METHODOLOGY:

The study is based on a literature review, where patient interventions shall not be there. So, apart from stationeries, internet, and/or library access, no other materials were required.

Data Sources: These shall be from Computerized database searches and hand searches, preferably from Google Scholar and Research Gate.

Ethical Considerations:

- ▣ Hence, the study is based on data collected from computerized database searches and hand searches; and not on human trials, no major ethical issues are there.
- ▣ Still, all the guidance of the University Research cell was strictly followed.

Inclusion Criteria:

- Articles with the targeted population – Post stroke: Upper-limb motor impairment.
- Experimental Studies based on Modified Constrained Induced Movement Therapy (mCIMT) and conventional Physiotherapy interventions shall be considered,
- Articles published in English only considered,
- Trails based on adult Post Stroke/ Hemiplegic conditions with arm dysfunctions, patients above 18 and above years,
- No limitations on the area of the study, race, gender...

Exclusion Criteria:

- Any duplicity in the studies
- Other language studies which can't be converted into English

- ☒ Inappropriate study reporting/ poor analysis
- ☒ If the study outcome is not reported as per the interest of the current study in an appropriate manner,
- ☒ Studies already excluded by various editorials/ publishers,
- ☒ Studies on co-morbid patients with Stroke shall not be considered.
- ☒ Trails on recurrent Stroke shall be omitted.
- ☒ Publications with data not reliably extracted or overlapping data.

PROCEDURE

- ❖ After framing the research question, the protocol for the study was designed,
- ❖ The data/ studies were collected from Computerized database searches,
- ❖ Then the studies were Scrutinized as per the Inclusion and exclusion criteria
- ❖ Simple the steps involved in the study based on post-stroke patients shall be 1. Framing the research question, 2. Designing the protocol, 3. Layout criteria, 4. Searching for databases, 5. Scrutinize the full test quality studies, 6. Extracting the data as per the eligibility criteria, 7. Synthesizing the extracted studies and 8. Final analysis.
- ❖ Literature reviews of the finalized studies were then carried- on.
- ❖ A total of 34 works of literature congregated for the screening and 09 full-text studies were qualified after the application of inclusion criteria, lastly 04 studies were settled for the review of exclusion criteria.
- ❖ The literature review study on Modified Constrained Induced Movement Therapy (mCIMT) versus conventional Therapy/ rehabilitation interventions is done as per the flow chart given below

(kindly refer Fig.01). In addition to that a separate chart of description as the PRISMA flowchart 2020 version is also displayed that detail the entire screening procedure that finalized 04 studies, from 34 articles collected *(kindly refer Fig.02)*.

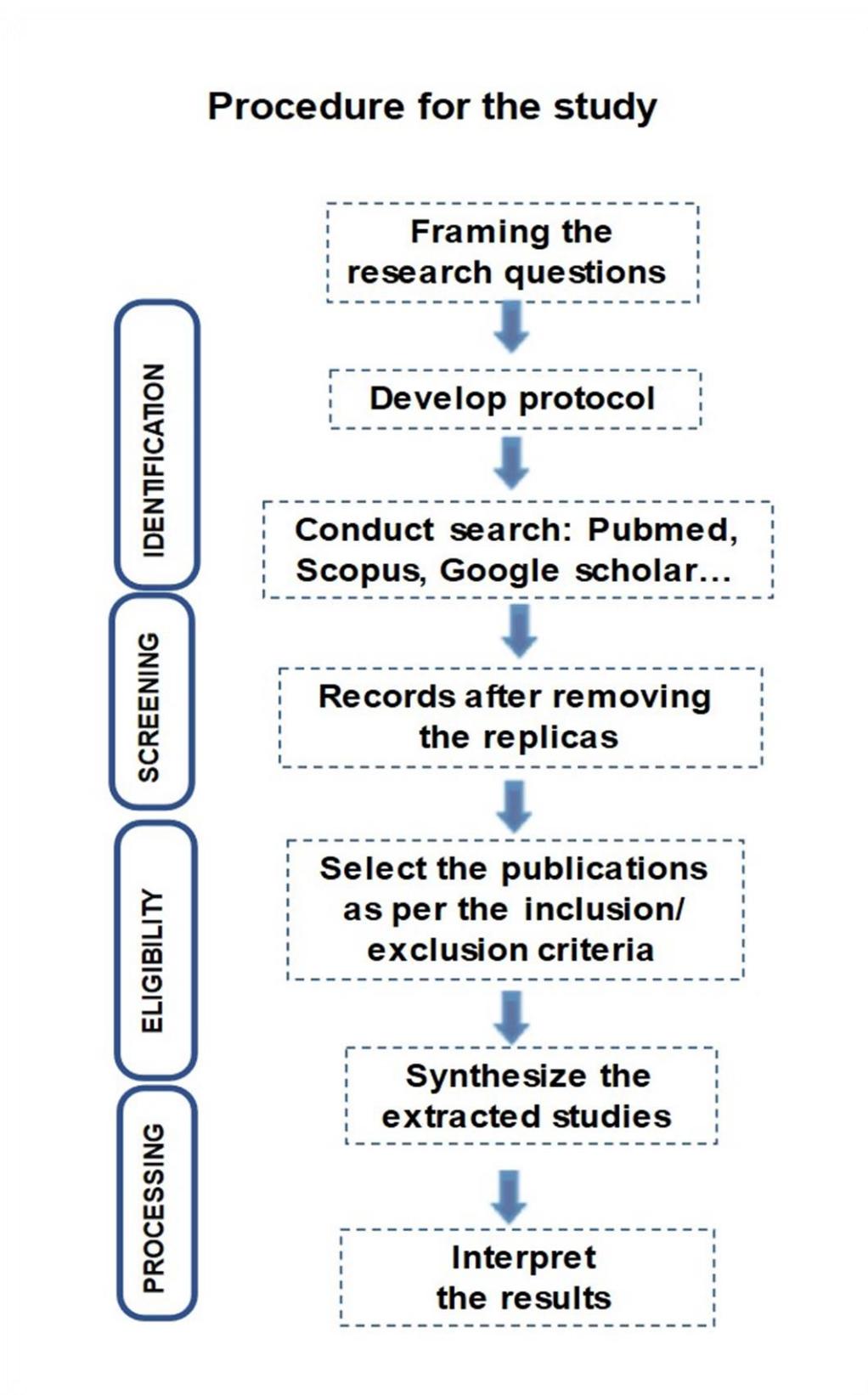


fig.01 The Procedure for the study “A literature review of modified constraint induced movement therapy (mCIMT) as an effective intervention in improving the paralytic upper-limb of stroke survivors.”

Fig. 02 The screening procedure for the study, as per the PRISMA flow chart. The selection of the literatures finalised for the study is displayed.

Literatures identified for the review on mCIMT

Fig. 03 The detailed data sheet for the four finalized papers.

THE RCT ON mCIMT Vs CR/TR - DATABASE EXTRACTION SHEET FOR THE LITERATURE REVIEW

Sl No	Author & Year of Publication	Type of patients included	Therapy applied	Study design	Assessment Scale	No of patients	Statistical approach	Effect
01	Raj Kumar Yadav et al (2016)	Stroke patients	mCIMT Vs Conventional Rehab'	Prospective single blind, parallel randomized controlled trial	FMA score for UP, MAL scale, AOU score and Quality of Use Score	65 (32 + 33)	Post-hoc analysis	mCIMT is effective
02	Ching-yi Wu et al (2007)	Stroke patients with 12 - 18 months	mCIMT versus Traditional rehabilitation	Randomized Controlled Trial	MAL, FIM, a 6-point quality of movement (QOM) scale	30 (15 + 15)	ANCOVA	mCIMT produced more ballistic/preplanned reaching movement
03	Stephen J. Page et al (2005)	Sub-Acute Stroke	mCIT Vs Traditional rehabilitation	A multiple baseline, randomized, controlled pre-post design was applied	Fugl-Meyer and ARA Scales applied	10 (05 + 05)	t-test	mCIT is a feasible and efficacious strategy
04	Iuly Treger et al (2014)	subacute stroke patients	mCIMT Vs Conventional Rehab'	A single-blinded randomized controlled trial	(1) transfer pegs from a saucer to a pegboard; (2) grasp, carry, and release a hard rubber ball; & (3) "eating,"	28 (1:2 ratio)	Pre-test: Posttest comparison	study provides additional support for the use of mCMIT

fig.03 The fourfinalised studies from the database for the literature review.

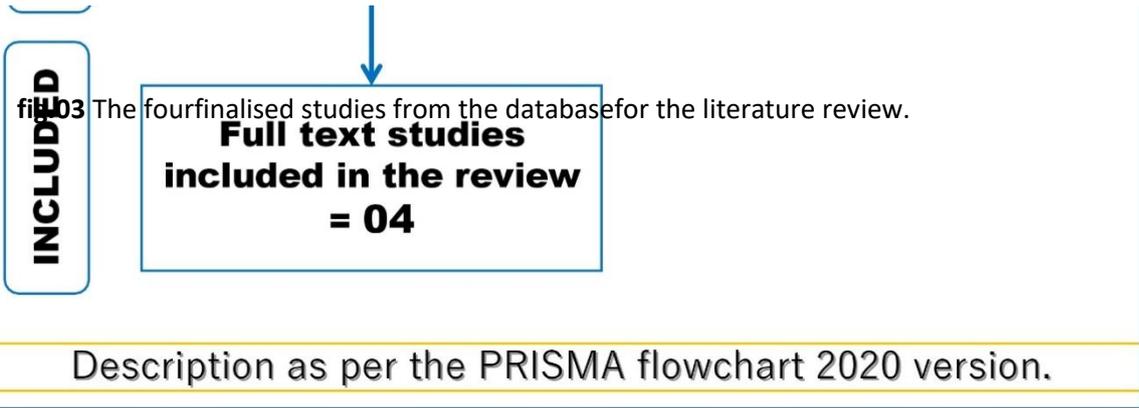


fig.02 The screening Procedure for the study “A literature review of modified constraint induced movement therapy (mCIMT) as an effective intervention in improving the paralytic upper-limb of stroke survivors” as per the PRISMA flowchart 2020 version

DISCUSSION

The literature review is proposed to forage the opening possibilities of modified constraint-induced movement therapy (mCIMT) for the motor

recovery of the paretic arm in post-stroke cases. The paretic upper limb in stroke patients has a significant impact on the quality of life. mCIMT if proven promising where the parameters are more refined and the task shall be easier for patients, which shall be also labelled as a 'Child-Friendly Technique'.

This study screened 34 trials on stroke with mCIMT versus conventional rehabilitation from the electronic database. Out of these 22 were from Google scholar, 06 from Research Gate and 06 from other streams. Under severe screening, only 04 studies were finalized for review. The entire process was detailed in a PRISMA flow chart, 2020 version (kindly refer to Fig.02).

All four studies were based on mCIMT versus Conventional therapy. A total of 133 cases belong to acute, sub acute, and chronic stroke category. All the study designs were based on a randomized controlled design, with some minor variations. Pre-test and post-test assessment tools used vary from one another. Duration of the pre-test to post-test duration and application of repeated post-test were also unrelated. The study statistical review is also varied- Post-hoc analysis, ANCOVA, t-test, and Pre-test: Post-test comparisons are applied. Due to these discrepancies, a qualitative review shall be possible.

Raj Kumar Yadav et al (2016) conducted a study on 65 post-stroke cases and established the effectiveness of mCIMT. The study of Ching-yi Wu et al (2007) on 30 chronic stroke cases mCIMT produced more ballistic/pre-planned reaching movement. Stephen J. Page et al (2005) had an RCT with 10 sub-acute stroke patients and concluded that mCIT is a feasible and efficacious strategy. And the last study of Luly Treger et al (2014) on 28 sub-acute stroke patients provides additional support for the use of mCMIT. The extended recovery benefits in terms of motor recovery are not specified in

these literatures. All four papers had evidence of modified constraint-induced movement therapy (mCIMT) as an effective therapy, in improving the upper limb functional impairment post-stroke. The initial screening had only one Indian publication on mCIMt technique, which indicates that it is not much to explore in countries like India where the hemiplegic population with impairments is high. There is a huge possibility with this technique, as it is cost-effective and can be implemented in any part of the world. So high-end explorers are recommended to prove its better effectiveness and to fix the parameters for accuracy.

CONCLUSION

This momentary literature review concludes by stating that modified constraint-induced movement therapy (mCIMT) is an effective approach for improving the functions of the paretic upper limb among post-stroke patients.

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