



The Effectiveness of Mirror Therapy with Stroke Patients in Producing Improved Motor and Functional Outcomes



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Abstract

Objectives: this study was conducted to review the literature on mirror therapy and to examine the scientific evidence on the effectiveness of utilizing mirror therapy to improve motor and functional outcomes with individuals post-stroke.

Results: our review found three studies suggesting that in stroke patients, mirror therapy compared to standardized hand exercise program may lead to improved motor and functional outcomes.

Conclusion: mirror therapy is effective and helpful in improving upper extremity motor and functional outcomes for patients with stroke.

Keywords: Mirror therapy; Hand; Upper extremity; Randomized control; Motor function; Stroke

Introduction

Strokes occur when there is a lack of blood flow to the brain or bleeding that occurs on the brain as a result of a broken blood vessel Gillen & Burkhardt [1]. As a result, the brain does not receive sufficient oxygen and nutrients which results in the death of brain cells which can have profound effects, such as sensorimotor deficits, language deficits, cognitive and visual deficits. Stroke is the leading cause of adult disability in the USA with more than 795,000 new strokes every year American Heart Association [2]. A study reported that 85% of stroke survivors will have hemiparesis and 55% to 75% will have impaired upper extremity function Yavuzer et al. [3] 2008. Numerous interventions to address these deficits have been used, such as compensatory and remedial strategies for Activities of Daily Living (ADLs), Neurodevelopmental Treatment (NDT), e-stim, bilateral integration, etc. Mirror Therapy is one relatively new intervention utilized to target restoring motor skills with the ideas that improving upper extremity function will also decrease disability.

Mirror therapy in stroke patients involves performing movements of the unimpaired limb while watching its mirror reflection superimposed over the unseen impaired limb, thus creating a visual illusion of enhanced movement capability of the impaired limb and visual feedback for motor relearning Sutbeyaz [4].

The purpose of this study was to review the literature on mirror therapy and to examine the scientific evidence on the effectiveness

of utilizing mirror therapy to improve motor and functional outcomes with individuals post-stroke. For the purpose of this study, we created a clinical/research PICO question (Population, Intervention, Comparison, and Outcome), a key to evidence-based decision Richardson [5]. The PICO formed for our study is as follows:

P: In stroke patients,

I: Does mirror therapy and a traditional rehabilitation program

C: Compared to a traditional rehabilitation program and an attention controlled condition

O: Lead to improved motor and functional outcomes?

Methods

Review of literature and search strategy

A research has been made in the following databases: Ovid, MEDLINE, and CINAHL. Keywords and Search items used to search articles for our study were Mirror therapy, hand, upper extremity, randomized control, motor function, and stroke. Four randomized controlled studies produced. Three of the four pertained to PICO question. Based on the hierarchy of levels of evidence in evidence based practice, all three studies were level II single blinded randomized controlled trials (RCTs) Hughes [6]. In reviewing the articles they were summarized in order of publication.

Results

Article evaluation matrix (summary sheet) has been created for reviewed articles in relation to our PICO question (Table 1).

Discussion

Our thorough review revealed that all studies were level II randomized controlled studies. Yavuzer et al. [3] had the largest number of participants and smallest percentage of dropouts. In

addition, it evaluated short term and long term outcomes. Sutbeyaz et al. [4] focused on LE function. In Dohle et al. [7], the control group had significantly more ($p=0.024$) ADL training as part of standard therapy program than mirror group. Therefore, Yavuzer et al. [3] was selected in our study as the strongest evidence. Thus clinical guidelines, recommendations, a plan and audit tool have been developed in our study to implement mirror therapy in clinical setting (Table 2).

Table 1: A summary of articles “Articles Evaluation Matrix” in relation to PICO.

Citation	Target Population	Study Design	Interventions	# of Subjects (N)	Outcomes
Dohle et al. [7]	Severe hemiparesis post Cerebrovascular accident (CVA)	Design --	Standardized UE exercise protocol for 30 minutes/day, 5 days a week, for six weeks with or without mirror	Sample size:	Did the intervention(s) --increase function? --decrease function? --no difference?
		Single blinded RCT		Total: -N = 36	No significant difference between groups in motor function in arm, hand, and fingers (Fugl-Meyer) Distal Plegic subgroup
		Level --	-Participation in standard inpatient rehabilitation program	By group: -Mirror group (n=18)	*Mirror group improved significantly more ($p=0.048$) than control group on finger motor subtest No significant difference between groups for grasp, pinch, grip, gross motor movements on Action Research Arm Test (ARAT)
		Level II		-Control Group (n=18)	No significant difference between groups on Functional Independence measure (FIM) for ADL motor tasks
Yavuzer et al. [3]	Subacute CVA patients with impaired upper extremity (UE) function		Standardized hand and wrist exercises for 30 minutes/day, 5 days a week for 4 weeks with or without use of mirror	Total: -N=36	Evaluated at baseline, 4 weeks, and 6 months:
			Participation in standard inpatient rehabilitation program	By group: Mirror group (n=17) Control Group (n=19)	Four-week outcomes: Mirror group improved significantly more ($p=0.001$) for both hand and arm function on Brunnstrom stages No significant difference ($p=0.925$) between groups for spasticity on Modified Ashworth Scale (MAS) Mirror group improved significantly more ($p=0.001$) on functional self-care (FIM)
					Six-month outcomes: Mirror group improved significantly more ($p=0.048$) for hand and arm ($p=0.006$) function on Brunnstrom stage No significant difference ($p=0.876$) between groups for spasticity (MAS) Mirror group improved significantly more ($p=0.001$) on functional self-care (FIM)
Sütbeyaz, Yavuzer, Sezer, & Koseoglu [4]	Subacute CVA patients with impaired lower extremity (LE) function		-Standardized ankle dorsiflexion exercises with or without mirror for 30 minutes/day, 5 days a week, for 4 weeks	Total: N=33	Evaluated at baseline, 4 weeks, and 6 months
			-Participation in standard inpatient rehabilitation program	By group: Mirror group (n=17) Control Group (n=16)	Mirror group improved significantly more ($p=0.002$) for LE motor function at follow-up (Brunnstrom stages) No significant difference ($p=0.102$) between groups for spasticity at follow-up (MAS)

					<p>Mirror group improved significantly more (p=0.001) on functional self-care motor items at follow-up (FIM)</p> <p>No significant difference (p=0.610) between groups for walking ability at follow-up on Functional Ambulation Categories for walking (FAC)</p>
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Table 2: A summary of recommendations, plan, and audit tool.

Recommendation	Implementation Plan	Criteria	Audit Method	Compliance Plan
1. Staff member will review the literature on mirror therapy and attend continuing education training session to assist them in the development of the mirror therapy program	Supervisor will choose staff member and set aside time for staff member to complete research and attend training; supervisor and staff member will also schedule meetings to review findings and coordinate program	Staff member will have one month to attend continuing education training session, review literature, summarize findings, and meet with supervisor for first meeting; the staff member will be provided with one additional month to finalize review of written plan which includes equipment needed, cost of equipment, plan to store materials, proposal for program etc.	Supervisor will meet with staff member after one month to monitor progress and review findings; supervisor and staff member will meet again after one month to review updates and review final program outline	Completion of tasks is expected as part of staff member duties and staff member will be held accountable; failure to do so will affect performance review completed by supervisor and noted in personnel file
2. Training of therapists/ staff members on mirror therapy protocol, assessment tools, evidence, etc.	Staff member will schedule in-service meeting for all therapists to attend and new employees will also receive training; a video of the presentation will be taken for new employees and absent employees to watch at later date	Training will take place within two weeks from the time the program is finalized at meeting with supervisor- Employees absent from the meeting must arrange time to review video and ask questions within one week of meeting; All new employees will receive training as part of employee orientation program within two weeks of therapist start date; 100% of employees must complete training	A record of in-service presentations and attendance is kept by supervisors; the orientation checklist will also list mirror therapy as part of the orientation program and must be completed for orientation process to be completed prior to submitting to Human Resources and for orientation to be considered completed	Staff members who are not compliant in attending meeting or making up absence by watching video will meet with supervisor and it will be noted in employee personnel file
3. Staff will exhibit competence in mirror therapy	Staff member who completed research and presented protocol and in-service to staff will develop competency test	All staff members must take test within one week of presentation; staff members must get score of 80% or greater on test or retake exam; staff members must complete self-study or direct questions to staff member trainer and re-take until successful with score >80%; new staff members will also take as part of orientation phase and must pass with same percentage	Supervisor will review each employee's performance	Staff members who are not compliant will meet with supervisor and it will be noted in personnel file and will affect performance review
4. Screen patients to determine whether meet inclusion/exclusion criteria to participate in mirror therapy program	At initial evaluation, OTR will complete a checklist to determine whether a new patient is appropriate for intervention	Therapist will document in medical record whether patient is or is not a candidate for mirror therapy treatment and state the reason for exclusion if applicable; The primary therapist for the patient is responsible for updating coverage notes for therapists that may treat the patient to ensure compliance; This must be completed 100% of the time to meet compliance	Supervisor will review at random two patient charts per therapist on a quarterly basis; peer-audits will also take place and each staff member will review two patient charts for a co-worker and report findings using standard form to supervisor-if peer audit not completed by therapist 100% of time this will be noted in employee file	Supervisor will meet with individuals one on one as needed to review expectations as part of job duties-failure to comply will be noted in personnel file; The supervisor will also track reasons for lack of compliance. Supervisor will also ensure peer audits done 100% of time and lack of compliance will be noted in employee file

<p>5. Delivery of mirror therapy intervention and completion of assessments prior to treatment and after treatment concludes</p>	<p>Trained therapists will provide mirror therapy treatment to patients who were identified at initial evaluation; therapists will document patient participation in daily progress note; exercises to be completed daily as outlined in program; assessments will be completed prior to participation in program and at conclusion of participation in mirror therapy program</p>	<p>Patients identified will participate in mirror therapy program daily at least 90% of time; assessments will be completed by therapists 100% on timeline detailed</p>	<p>Supervisor will audit two charts per therapist to review documentation for patient participation/assessment in mirror therapy program on quarterly basis and two charts will be reviewed per therapist by a peer on a quarterly basis; feedback will be provided directly to the therapist and supervisor</p>	<p>Supervisor will meet with therapists who fail to have patients participate in program 90% of sessions and 100% of assessments to develop plan for correction-failure to make changes by following quarter will be noted in personal file and employee review. The supervisor will also note reason for lack of compliance</p>
<p>6. Ongoing evaluation of mirror therapy program</p>	<p>At the monthly staff meeting, the supervisor will provide opportunity for staff members to offer and receive feedback on program. The supervisor will review staff compliance, patient satisfaction/reports, and FIM outcome data across all patients to determine if trend/change since program initiated from previous standard rehabilitation program</p>	<p>Supervisor will review and evaluate program after 6 months and an ongoing semi-annual program evaluation will be completed going forward; Supervisor will make determination whether any modifications to the program are needed such as inclusion/exclusion criteria, timing and intensity, documentation guidelines, new research findings etc.</p>	<p>n/a</p>	<p>Supervisor will develop plan to address needs identified and implement changes to the program</p>

Conclusion

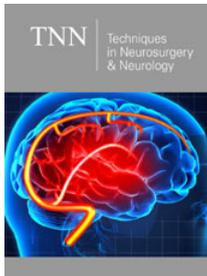
Our review suggests that mirror therapy is effective and helpful in improving upper extremity motor and functional outcomes for patients with stroke. Thus clinical guidelines, recommendations, a plan and audit tool have been created in our study to implement mirror therapy in clinics. The clinical guidelines for recommended intervention, the plan, and the audit tool recommend therapists to apply mirror therapy with individuals post stroke.

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