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Mirror therapy for the lower extremity after stroke

Submission date
22/10/2015

Recruitment status
No longer recruiting

Registration date
20/01/2016

Overall study status
Stopped

Last Edited
20/01/2020

Condition category
Nervous System Diseases

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
A stroke is a serious condition where the blood supply to a part of the brain is cut off, usually by a blood clot blocking an artery (ischaemic stroke) or a bleed (haemorrhagic stroke). A large proportion of stroke victims suffer from long-term complications depending on the area of the brain that is affected, which can affect their ability to move, speak or even their cognitive function (memory loss, difficulty reasoning and confusion). One of the most common complications of a stroke is paralysis (hemiplegia) or weakness (hemiparesis) on one side of the body. This can make movements such as walking very difficult and so patients need extensive physiotherapy to help them recover. Mirror therapy (MT) is a technique that uses the movements of the stronger limb to “trick” the brain into thinking that the weaker part of the body is moving. The therapy uses a mirror, placed at the midline of the patient, to hide the defective limb and reflect the movement of the unaffected limb. This causes the brain to attribute the movement of the reflection to the defective limb, giving the impression that both limbs are functioning normally. Previous studies have shown this technique to be very effective at improving arm and hand function, however little is known about the use of mirror therapy for the recovery of leg function and walking. The aim of this study is to find out whether using MT is an effective way to help stroke patients to improve the range of movement in the affected leg and to help them recover their walking ability.

Who can participate?
Adults stroke patients with normal vision, who have been admitted to the rehabilitation programme at Toronto Rehabilitation Institute.

What does the study involve?
Participants are randomly allocated to one of two groups who receive ten to fifteen 30-minute physiotherapy sessions. Those in the first group take part in mirror therapy training sessions throughout their time in the rehabilitation ward. In the sessions, participants are asked to perform bending and stretching exercises of the hip, knee and ankle with a mirror placed along their midline. The affected leg is positioned behind a curtain so that only the movements of the unaffected leg are seen in the mirror. The participants are asked to watch the movements of the unaffected leg in the mirror while trying to complete the exercises with both legs. Those in the second group are positioned in the same way and perform the same bending and stretching

movements. For these participants, the mirror is replaced with a non-reflective board so they cannot see the movements of their unaffected leg in a mirror. For both groups of participants, before and after the physiotherapy sessions, the degree to which their movement is affected is measured.

What are the possible benefits and risks of participating?
Participants may benefit from improved control of leg movement, as well as an improved gait (way of walking). Risks of taking part are small, however some participants may find the training sessions tiring or painful (lower back pain or muscle soreness).

Where is the study run from?
Toronto Rehabilitation Institute (Canada)

When is the study starting and how long is it expected to run for?
October 2014 to December 2016

Who is funding the study?
Physiotherapy Foundation of Canada (Canada)

Who is the main contact?
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Additional identifiers

Protocol serial number
14-7482

Study information

Scientific Title
Mirror, mirror, in therapy, whose leg moves with the most dexterity? A pilot study of a lower extremity, multi-joint mirror therapy intervention after stroke

Study objectives
The overall goal of the proposed project is to examine the feasibility of a multi-joint, lower extremity, mirror therapy intervention for the improvement of lower extremity motor impairment, spatiotemporal gait parameters and EMG activity gait profiles in individuals with stroke.
The hypotheses related to the main objective of the proposed study are:
1. Improvements in Chedoke-McMaster Stroke Assessment (CMSA) foot and leg scores will be greater in the MT intervention group than the control group after the intervention and at follow-up
2. Improvements in spatiotemporal gait parameters will be greater in the MT intervention group than the control group after the intervention and at follow-up
3. Improvements in lower extremity EMG amplitude and timing, with respect to the gait cycle, will approximate expected normal values and will be greater in the MT intervention group than the control group after the intervention and at follow-up

Ethics approval required
Old ethics approval format

Ethics approval(s)
The University Health Network Research Ethics Board, 17/10/2014, ref: 14-7482-DE

Study design
Randomized controlled pilot study

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Stroke

Interventions
Participants are randomly allocated to one of two groups:

Mirror Therapy intervention group: Participants will be positioned in long-sitting on a plinth with back support and a mirror at the participant's midline. Participants will then perform repeated bilateral hip and knee flexion-extension and ankle dorsiflexion movements and/or repeated bilateral hip adduction and abduction movements . The affected limb will be placed behind a curtain to block the participant's view of that limb. The unaffected limb will be positioned outside the curtain such that the movements are reflected in the mirror. The entire apparatus will be positioned to create the illusion of the affected limb moving as the unaffected limb would. Participants will be instructed to observe the reflection of their unaffected limb while performing the bilateral LE exercise.

Control intervention group: Participants will be positioned in the same manner as described for the MT invention group. Participants will also perform the same repeated bilateral hip and knee flexion-extension and ankle dorsiflexion movements. The MT apparatus will also be used, however the mirror will be replaced with a non-reflective board.

All participants will attend 10-15 training sessions. The exact amount will vary depending on the individuals' length of stay in rehabilitation. A goal of 30 minutes for the duration of each intervention session will be set but the actual duration will be guided by patient tolerance.

Intervention Type
Behavioural

Primary outcome(s)
1. Degree of motor impairment is measured using the Chedoke McMaster Stroke Assessment before and after the participant completes the mirror therapy sessions
2. Over-ground gait performance is measured using spatiotemporal gait parameters before and after the participant completes the mirror therapy sessions. Parameters of interest are gait velocity and temporal gait symmetry. Gait symmetry will be calculated using a ratio of left and right limb values for swing time as outlined in previous work.
3. EMG gait profile is measured by recording EMG activity bilaterally from the tibialis anterior, medial gastrocnemius, vastus lateralis and biceps femoris before and after the participant completes the mirror therapy sessions. Footfall events are recorded using insole foot switches.

Key secondary outcome(s))
1. Standing balance is measured using the Berg Balance Scale before and after the participant completes the mirror therapy sessions
2. Motor coordination is measured before and after the participant completes the mirror therapy sessions using the finger to nose test and the heel to shin test. These tests are video recorded with a digital camera to later analyse for performance and quality of movement
3. Electrodermal activity is measured during the first and last mirror therapy session completed by the participant
4. Electroencephlogram activity (EEG) and EMG activity coherence is measured during the first and last mirror therapy session completed by the participant

Completion date
31/12/2016

Reason abandoned (if study stopped)

Participant recruitment issue

Eligibility

Key inclusion criteria
1. First time occurrence of stroke
2. Normal or corrected to normal vision
3. Chedoke McMaster Stroke Assessment (CMSA) leg and foot score of 2 or greater
4. Passive ankle dorsiflexion to neutral, passive knee flexion to 60 degrees and passive hip flexion to 100 degrees
5. Have been admitted to the stroke rehabilitation program at the Toronto Rehabilitation Institute

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Key exclusion criteria
1. Visual neglect or inadequate vision that would impede the viewing of the mirror's surface
2. Bilateral stroke or bilateral sensorimotor impairments
3. Inability to comprehend and/or follow multiple step instructions

Date of first enrolment
01/11/2015

Date of final enrolment
30/11/2016

Locations

Countries of recruitment
Canada

Study participating centre
Toronto Rehabilitation Institute (University Health Centre)
550 University Avenue
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Sponsor information

Organisation
Toronto Rehabilitation Institute

ROR
https://ror.org/00mxe0976

Funder(s)

Funder type
Research organisation

Funder Name
Physiotherapy Foundation of Canada

Alternative Name(s)
Fondation de physiothérapie du Canada, PFC

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
Canada

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Available on request