The effects of internal and external attentional focus instructions on motor learning after stroke

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Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON43873

Source
ToetsingOnline

Brief title
Attentional focus instructions to enhance motor learning after stroke

Condition

- Other condition
- Structural brain disorders

Synonym
stroke; cerebrovascular accident

Health condition

CVA

Research involving
Human

Sponsors and support

Primary sponsor: Revalidatiecentrum Heliomare
Source(s) of monetary or material Support: Revalidatiecentrum Heliomare

Intervention

Keyword: Focus of attention, Motor learning, Rehabilitation, Stroke

Outcome measures

Primary outcome

Balance task: The threshold rotational stiffness at which the patient successfully manages to keep the board*s deviation below 2.5 degrees for 70% of the trial (RStiff2.5). Lower RStiff2.5 indicates better balance capacity.

Automaticity: Sample entropy and fluency (jerk) of balance board movements. Higher sample entropy indicates less regular and hence more automatic movement execution, while lower jerk values indicate more fluent and hence more automatic movements.

Cognitive dual-task performance (tone counting task): Accuracy (%) and reaction time (ms). To address a possible speed-accuracy trade-off, accuracy and reaction time are combined into a composite score: Performance = (Accuracy (%) / Reaction Time (ms)) x 100%

Dual-task performance: Dual-task Costs (DTC) = (Dual-task performance - Single-task performance) / Single-task performance * 100%

Secondary outcome

Cognitive functioning: Neuropsychological test scores will be expressed in

standardised scores (z-scores)

Tests of motor functioning, mobility, daily functioning/quality of life

- Berg Balance Scale score (0-56)

- Timed-up-and-Go score: time needed to complete test (in seconds)

- Posturography: Amplitude of center-of-pressure (COP) & total path length of

COP

- 10 meter walk test: time needed to walk 10 meters (seconds)

- FAC score (0-5)

- USER

- NSA (lower extremity: 0-80)

Movement-Specific Reinvestment Scale (MSRS; 10-60)

- Patients' inclination to consciously control their movements with an internal

focus (Conscious Motor Processing subscale; 5-30)

- Degree to which patients feel self-conscious about/monitor their style of

moving (Movement Self-Consciousness subscale; 5-30)

Study description

Background summary

Dual-task performance is often impaired after stroke. One way to target this problem is to enhance patients' automaticity of movement, as more automatized movement should require less attentional control, and hence allow for better dual-task performance. Recent evidence suggests that enhancing automaticity of

movement can best be achieved by triggering an external focus of attention (on movement effects) when relearning movements, rather than an internal one (on movement execution itself). In healthy adults, it has consistently been found that an external focus accelerates skill acquisition, results in enhanced movement automaticity, and hence facilitates dual-task performance. However, it remains to be seen whether these results also generalize toward the stroke patient population, and whether an external focus can indeed enhance motor recovery post-stroke.

Study objective

The primary objective of this study is to assess whether motor learning using external attentional focus instructions results in superior single-task motor performance, movement automaticity, and dual-task performance in inpatient stroke patients when compared with internal focus instructions.

Study design

Intervention study:
This study is a single-blind randomised trial concerning the effect of different attentional focus instructions on motor learning after stroke.

Sixty patients will be included, and randomly assigned to an internal or external focus group. Patient characteristics regarding demographics, stroke characteristics, and motor/cognitive functioning will be recorded from the patients medical file before start of the study.

Wearing a full-body safety harness, patients will practice to stabilize a balance board (75 x 75 cm) that can only rotate along a horizontal axis in the patients* frontal plane and has a maximal range of motion of 30 degrees. Patients* goal is to stand as still as possible for 30 seconds, with their feet placed at hip width. Task difficulty can be manipulated by adjustment of the board's rotational stiffness.

Baseline measurements are spread out across two sessions. In the first session, the Timed-up-and-Go, posturography, 10 meter walk test, MSRS, and USER will be determined.
On the second baseline session, we will use a 2-down-1-up modified staircase procedure to determine the threshold rotational stiffness at which patients are just able to remain in balance (i.e., keep the deviations of the board below 2.5 degrees) for 70% of the trial. The procedure is as follows. Patients perform 16 single-task trials (of 30 seconds each). Every patient performs the first trial at a rotational stiffness of 150 Nm/rad. Patients* performance is then evaluated using the criteria outlined below:

(1) SUCCES = Board deviations are within 2.5 degrees for > 70% of the trial &

patient does not grab the handrail
(2) REDO TRIAL = Board deviations are within 2.5 degrees for > 70% of the trial & patient grabs the handrail 1 or 2 times
(3) FAILURE = Board deviations are within 2.5 degrees for > 70% of the trial & patient grabs handrail > 2 times
(4) FAILURE = Board deviations are within 2.5 degrees for < 70% of the trial (regardless of how many times the handrail was grabbed)
Further, the following rules will be applied:
#1: 2x success in a row = reduce rotational stiffness with -50 Nm/rad
#2: 1x failure = increase rotational stiffness with +40 Nm/rad
#3: Every reversal = halve step size (down to a minimum of -6.25 Nm/rad & +5 Nm/rad)
#4: 4x consecutive successful/failed trials = double step size (up to a maximum of -50 Nm/rad & +40 Nm/rad)
#5: 2x consecutive ""REDO TRIAL"s = counts as failure (i.e. rotational stiffness for next trial will be increased)

Afterwards, a regression line is fit through the obtained 16 data points, to establish the RStiff2.5 (i.e., threshold rotational stiffness at which the patient successfully manages to keep the board*s deviation below 2.5 degrees for 70% of the trial). This RStiff2.5 value will serve as the benchmark value with which the individual patient will start his/her first training session. Finally, patients will perform 2 single- and two dual-task trials at this individually determined RStiff2.5 value. No specific attentional focus instructions will be given throughout this baseline assessment ("Try to stand as still as possible"). For dual-task trials, patients will also be instructed to prioritize balance performance over cognitive performance.

Patients will practice the balancing task in fifteen 30-second trials (within 30-minute sessions), 3 times a week, for a period of 3 weeks (135 practice trials in total). Trials will be separated by 90-second rest intervals. Before the start of each trial, patients will receive an internal or external focus instruction. As stated earlier, patients will perform the first block of 5 trials in the first practice session with their personal RStiff2.5. Depending on the patients' average performance in the preceding block, the rotational stiffness for the next block of 5 trials can either be reduced with -20% (performance > 70% & < 2x grabbing the handrail), unchanged (performance > 70% & >2x grabbing handrail | performance 60-70% & <2x grabbing handrail), or increased with 20% (performance<60% | performance 60-70% & > 2x grabbing handrail). The stiffness of the balance board is adjusted in this manner from each practice session to the next to ensure that the task remains sufficiently challenging throughout practice.

After one week of practice, a post-test is performed at which the RStiff2.5 is again determined (following the same procedure as at baseline). Also, after the complete training has been completed a second post-test is performed, at which the RStiff2.5 is determined. Also, at this point the TUG, posturographic

measurements and USER are administered again as well. Post-tests are done by an experimenter who is blind to group allocation.

Assessment of reliability and validity of balance board assessment:
After inclusion for the RCT has been concluded, we will include an additional 22 patients to assess the balance board assessment's concurrent validity and test-retest reliability. These 22 patients will only perform the baseline balance board measurement twice, on two consecutive days. Also, they will perform a subset of the clinical tests described above. Specifically, they will complete the posturographic measurements, NSA, and MSRS, while the scores on the BBS, FAC, neuropsychological tests, and USER will be obtained from their medical files. The clinical tests will be conducted on the first measurement day, prior to the first balance board assessment. Concurrent validity is then assessed by correlation the RStiff 2.5 with the BBS score and posturographic performance measures. Test-retest reliability is assessed by comparing the balance board scores of both measurement occasions.

Intervention

The experimental intervention is the manipulation of attentional focus when learning a balancing task.
During practice, the internal focus group will receive instructions that direct their attention toward movement execution ("Try to keep your feet as still and horizontal as possible"). The external focus group will receive instructions that direct their attention toward the outcome/effects of their movements ("Try to keep the balance board as still and horizontal as possible").

Study burden and risks

The (extra) risks associated with participation are deemed negligible. Participants will practice a balancing task that is often practiced within conventional rehabilitation therapy. Patients will wear a safety harness, and performance is continuously monitored by the investigator. Task difficulty will be adjusted to the patients' abilities, trials are of short duration (30 seconds), and rest breaks in between trials are of sufficient duration. Therefore, the risks and psychological/physical burden associated with participation are considered minimal, and certainly will not exceed those associated with regular conventional rehabilitation therapy,

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

- (First-ever & recurrent) stroke resulting in sub and/or supratentatorial brain damage
- Receiving inpatient care in Heliomare
- Time since stroke < 6 months
- Functional ambulation categories score > 2
- Able to stand independently for at least 1 minute
- Able to understand instructions and cooperate with neuropsychological assessment (as judged by the patient*s neuropsychologist)

Exclusion criteria

- No other neurological impairments
- No orthopaedic impairments
- No uncorrected hearing impairment

Study design

Design

Study type: Interventional

Masking:	Single blinded (masking used)
Control:	Uncontrolled
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	07-03-2016
Enrollment:	82
Type:	Actual

Ethics review

Approved WMO Date:	06-01-2016
Application type:	First submission
Review commission:	METC Amsterdam UMC
Approved WMO Date:	11-04-2016
Application type:	Amendment
Review commission:	METC Amsterdam UMC
Approved WMO Date:	26-01-2017
Application type:	Amendment
Review commission:	METC Amsterdam UMC

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL54560.029.15

Study results

Date completed:	01-08-2017
Actual enrolment:	88