Supplementary material 14: Further details of trials included in the Cochrane Review

An 2019 [1]	
Methods	**Design:** RCT **Country**: South Korea **Sense(s) addressed**: Somatosensation (Pusher Syndrome)
Participants	**Inclusion Criteria:** · Pusher Syndrome (Burke Lateropulsion Scale ≥ 2) · Within 3 months post-stroke · 20-80 years old · K-MMSE score >24 · Ability to stand for 30 minutes · sufficient strength to use the body-tilt equipment · height 145-195 cm · weight <150kg **Exclusion Criteria**: · Medically unstable · Lesions of the brain stem or cerebellum · Heart disease, epilepsy, other medical conditions · Neglect **Study population (number randomised):** 14
Interventions	**Comparison:** Active Intervention 1 vs Active Intervention 2 **Active treatment 1** **Name:** Game-based vertical posture training **Classification of intervention:** rehabilitation (restitution) **Materials:** "Spine Balance 3D" a specialist tilt apparatus, consisting of tilting main body support, force plates, trunk sensor and screen for visual feedback **Procedures:** the participant is placed in the Spine Balance 3D trainer, with pelvis, thigh and ankle fastened and trunk sensor attached. There were three stages of game-based training: 1: static postural training with visual feedback, - no tilt, asked to maintain posture using information on monitor 2: dynamic postural training with visual feedback - weight is shifted to the non-paralytic side, stimulated by the instruction to grab an object on the non-paralytic side 3. dynamic postural training without visual feedback - as 2, with screen turned off **Who delivered:** not reported **Mode:** one-to-one **Where:** hospital inpatient **Session:** 30 mins 2x per day, 5 days per week **Duration:** 3 weeks **Tailoring:** difficulty level was adjusted relative to performance **Modification:** none noted **Active treatment 2**

	Name: standard vertical posture training **Classification of intervention:** rehabilitation (restitution) **Materials:** not reported **Procedures:** not reported **Who delivered:** not reported **Mode:** one-to-one **Where:** hospital inpatient **Session:** 30 mins 2x per day, 5 days per week **Duration:** 3 weeks **Tailoring:** not reported **Modification:** not reported Does normal therapy continue? unclear
Outcomes	**ADL:** K-MBI **Perception:** Burke Lateropulsion Scale **Motor:** Postural Assessment Scale for Stroke, Balance posture ratio **Timing:** immediately post intervention
Funding statement	**Funding statement:** none reported **Conflict of interest statement:** none reported
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on method of randomisation
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information provided
Incomplete outcome data (attrition bias)	Low risk	All participants included in analysis

All outcomes		
Selective reporting (reporting bias)	Low risk	All outcome measures accounted for
Other bias	Unclear risk	Unclear regarding baseline differences - had difficulty in securing homogeneity
An 2020 [2]		
Methods	**Design:** 2-arm RCT **Country**: South Korea **Sense(s) addressed**: somatosensation	
Participants	**Sense(s) addressed**: somatosensation **Inclusion Criteria:** • unilateral hemiplegia after a first hemispheric stroke confirmed by CT or MRI; • subacute stroke stage (< 2 months since onset) • age 20 to 80 years • lateropulsion with Scale of Contraversive Pushing (SCP) score > 0 • orthostatic tolerance for 30 min on passive standing; • no severe cognitive impairment based on the Korean MiniMental Status Examination (score > 24); • 1.45 to 1.95 m tall and body weight < 150kg **Exclusion Criteria**: • unstable medical conditions, such as cardiac disease, epilepsy, and vestibular disorders; • pure brainstem or cerebellar lesion; • severe visual or auditory impairments. **Study population (number randomised):** 30 stroke survivors	
Interventions	**Comparison:** active treatment 1 vs active treatment 2 **Active treatment 1** **Name:** whole-body tilting postural training (WTPT) (n=15) **Classification of intervention:** Rehabilitation (restitution) **Materials:** "Spine Balance 3D" a specialist tilt apparatus, consisting of tilting main body support, force plates, trunk sensor and screen for visual feedback. **Procedures:** the participant is placed in the Spine Balance 3D trainer, with pelvis, thigh and ankle fastened and trunk sensor attached. There were four stages exercise and game-based training: 1: static postural training with visual feedback,- no tilt, asked to maintain posture using information on monitor 2: dynamic postural training with visual feedback,- as 1, but with tilt up to 30degree for 5 seconds 3. dynamic postural training without visual feedback - as 2, with screen turned off 4. automated dynamic postural training using games. **Who**: Physiotherapists (with more than 5 years' experience). **Mode**: one-to-one. **Where:** inpatient. **Session:** 30 minutes, two times per day, 5 days per week **Duration:** 3 weeks **Tailoring:** "The task difficulty was increased gradually by increasing the speed and range of trunk movement according to the	

	performance. Depending on the performance, the participant was moved to the next stage. For the participant's safety or accurate training, verbal and physical assistance was provided by the physiotherapist when necessary" **Modification:** none stated **Active treatment 2** **Name:** general postural training (GPT) (n=15) **Classification of intervention**: Rehabilitation (restitution) **Materials:** physiotherapy tools including seat, treatment mat, mirror, balls. **Procedures:** postural training using feedback and weight shifting to the non-paretic side. Four stages, (with 1 and 2 incorporating verbal feedback from the therapist)1. static training seated on a map, using a mirror and vertical cues to maintain a vertical position 2. whilst on the map, moving to reach objects on the paretic side by weight shifting,3. as stage 2, but without visual cues or verbal feedback4. to remain in a vertical position while doing other tasks, such as counting. **Who:** Physiotherapists (with more than 5 years' experience) **Mode:** one-to-one. **Where:** inpatient **Session:** 30 minutes, two times per day, 5 days per week **Duration**: 3 weeks **Tailoring:** "We gradually increased the difficulty of the task by changing from the sitting to standing position according to the task performance in all training sessions. If the participant performed well, they moved to the next stage. For the participant's safety or accurate training, verbal and physical assistance by the physiotherapist was provided if necessary" **Modification:** none stated Participants in both groups received individual sessions of occupational, speech, and cognitive therapy during hospitalization (5 days/week).
Outcomes	**ADL:** Korean-modified Barthel index (K-MBI) **Adverse events:** Number of events **Motor (including balance):** Fugl-Meyer Motor Assessment-Lower Extremity (FMA-L), Berg Balance Scale, Postural Assessment Scale for Stroke (PASS) **Others:** Burke Lateropulsion Scale (BLS), **Timing:** immediately after intervention,
Funding statement	**Funding statement:** none reported **Conflict of interest statement:** "The authors declare that they have no competing interest"
Notes	**Trial registration details:** Korea Centers for Disease Control and Prevention (registration no.: KCT0004242) **Published protocol:** none stated **PPI:** none stated No statement on pilot/feasibilty design; no power calculation reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence	Low risk	Participants were randomly allocated using numbered cards

generation (selection bias)		
Allocation concealment (selection bias)	Low risk	Cards were drawn from a sealed box
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Two blinded evaluators but not reported for performance bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	All randomised participants were included in the the analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported in full
Other bias	Low risk	The groups did not differ in demographic or clinical characteristics at baseline. No other concerns noted
Bergmann 2018 [3]		
Methods	**Design:** RCT **Country**: Germany **Sense(s) addressed**: Somatosensation	
Participants	**Inclusion Criteria:** • hemiparesis after first unilateral ischemic or haemorrhagic stroke • 3 weeks to 6 months since onset • age between 18 and 90 years • pusher behaviour (Scale for Contraversive Pushing [SCP] >0 per component • orthostatic tolerance for 30 minutes of passive standing **Exclusion Criteria**: • extreme osteoporosis • unstable fracture • excessive spasticity • acute diseases of the cardiovascular or respiratory system • pressure sores on the lower extremities • body weight was limited to 130 kg, body height to 200cm, and maximum leg length difference 2 cm **Study population (number randomised):** 38	

Interventions	**Comparison: Active treatment 1 vs active treatment 2** **Active treatment 1** **Name:** Robot-assisted gait training **Classification of intervention:** Rehabilitation (restitution & substitution) **Materials:** Lokomat robotic device **Procedures:** Use of a harness, which is attached to a body-weight support system, and by cuffs placed around legs. Elastic straps are used to passively lift participants feet and prevent foot drop. Bodyweight support was individually set for each patient but amounted to no more than 50% of the patient's body weight. Guidance force was set at 100% on both sides. After a short warming-up period, walking speed was increased to 2 km/h or faster. The target walking time was at least 20 minutes **Who delivered:** Therapists **Mode**: Not reported **Where:** Inpatient **Session:** 8-10 sessions **Duration:** 60 minutes, 5 days per week for 2 weeks **Tailoring:** Not reported **Modification:** Not reported Does normal therapy continue? No **Active treatment 2** **Name:** Non-robotic physiotherapy **Classification of intervention:** Rehabilitation (restitution) **Materials:** Lokomat robotic device **Procedures:** Training of postural control including sensory feedback components. Active and dynamic exercises, such as shifting of the centre of gravity; no passive or static exercises were planned. Therapists and patients were allowed to use external references, such as a wall or a handrail on the nonparetic side, and visual feedback, such as the doorframe or a mirror. Training was performed while sitting or standing; movement transitions, such as transferring from sitting to standing, and walking, if possible, were practised. **Who delivered:** Therapists **Mode**: Not reported **Where:** Inpatient **Session:** 8-10 sessions **Duration:** 60 minutes, either 2 × 30 minutes or 1 ×30 minutes with "co-therapy" (2 therapists; the target was at least 20 minutes of active therapy) 5 days per week for 2 weeks **Tailoring:** Not reported **Modification:** Not reported
Outcomes	**Category:** **Mobility and Navigation:** Performance Orientated Mobility Assessment, Functional Ambulation Classification **Perception:** Subjective Visual Vertical **Other:** Scale for Contraversive Pushing, Burke Lateropulsion Scale **Timing:** For overview of included outcome measures see Table 4
Funding statement	**Funding statement:** This work was supported by funds from the German Federal Ministry of Education and Research (BMBF IFB 01EO0901) **Conflict of interest statement:** The authors report no disclosures relevant to the

	manuscript
Notes	**Trial registration details:** This trial was registered at the German Clinical TrialsRegister (DRKS00003444) **Published protocol:** No **PPI:** none reported An a priori sample size calculation was performed using the method derived by Noether. Effect size was estimated based on the data of the previous pilot study resulting in $p_{noether}$=0.8 for the BLS. Assuming this effect size with a 2-sided significance level of 0.05% and 80% power, sample-size calculation resulted in a sample size of 15 patients per group. To account for an anticipated dropout rate of 25%, the minimum number of patients required to enrol per group was increased to 38 patients for the entire study.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomisation sequence was computer generated
Allocation concealment (selection bias)	Low risk	Sealed opaque envelopes used
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Assessor was blinded but not reported for performance bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants accounted for
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	High risk	No statistically significant differences between the intervention and control groups were found however it states that several participants had severe cognitive deficits and were unable to complete the cognitive examination. No correlation was found between the cognitive examination score and outcome measure score however these deficits may have influenced the

		participants response to the interventions. This was particularly relevant to the control group as the intervention involved more explicit learning processes.

Carey 2011 [4]	
Methods	**Design:** RCT with partial crossover **Country**: Australia **Sense(s) addressed**: mixed (tactile and somatosensory)
Participants	**Inclusion Criteria:** • stroke survivors, at least 6 weeks poststroke. • impaired texture discrimination, limb position sense, and/or tactile object recognition • medically stable • adequate comprehension of instructions and perceptual ability for assessment • able to commit time to participate in the rehabilitation program. **Exclusion Criteria**: • evidence of unilateral spatial neglect, based on standard neuropsychological assessments • prior history of other central nervous system dysfunction or peripheral neuropathy **Study population (number randomised):** 50
Interventions	**Comparison:** active intervention vs active intervention **Active treatment 1** **Name:** Sensory discrimination training **Classification of intervention:** rehabilitation (restitution and compensation) **Materials:** "graded stimuli with varying surface characteristics" and "Tactile object recognition training focused on discrimination of shape, size, weight, texture, hardness, and temperature using a range of multidimensional, graded object" **Procedures:** the intervention used ~~applied the~~general ~~generalized~~ sensory discrimination training, in ~~to~~ 3 sensory tasks ~~:~~ (texture discrimination, limb position sense, and tactile object recognition). Training ~~employed~~ used a range ~~a variety~~ of stimuli ~~within each sensory dimension trained~~, graded progression ~~of discriminations from easy to difficult~~, attentive exploration with vision occluded, anticipation trials, ~~cross-modal calibration via vision, feedback on sensation and method of exploration,~~ intermittent feedback and self-checking of accuracy, feedback on sensation and method of exploration, feedback on ability to identify distinctive features in new~~ovel~~ stimuli, ~~tuition of training principles, and~~ and summary feedback ~~and intensive training.14~~ During ~~each~~ sessions, subjects were trained on each sensory task, in random ~~sequence~~order, for 15 to 20 minut~~es~~es ~~at a time~~. Texture

	discrimination training used graded stimuli with varying surface characteristics.~~14~~ Limb position sense was trained across a wide range of limb positions of the upper limb. Tactile object recognition training focused on discrimination of shape, size, weight, texture, hardness, and temperature. ~~using a range of multidimensional, graded objects~~ **Who delivered:** "therapist" **Mode**: one-to-one **Where:** Not reported **Session:** 60 mins, 3 x week **Duration:** 10 hours in total **Tailoring:** none reported, but it is possible exercises were tailored to individual ability **Modification:** none reported **Active treatment 2** **Name:** Exposure to tactile stimuli **Classification of intervention:** rehabilitation (unclear) **Materials:** "stimuli varying in texture, shape, size, weight, hardness, and temperature" and "common objects" **Procedures:** non-specific repeated exposure to stimuli, via grasping of common objects, and passive movements of the upper limb. **Who delivered:** "therapist" **Mode**: one-to-one **Where:** Not reported **Session:** 60 mins, 3 x week **Duration:** 10 hours in total **Tailoring:** none reported **Modification:** none reported Does normal therapy continue? no. "Patients were recruited to the study after they had completed their inpatient and outpatient therapy or community-based follow-up, to minimize any confound with co-therapies"
Outcomes	**Perception**: Standardized somatosensory deficit (composite of texture discrimination (Fabric Matching Test; FMT), limb position sense (Wrist Position Sense Test; WPST) and tactile object recognition (functional Tactile Object Recognition Test; fTORT) **Adverse Events:** numbers affected **Timing:** immediately after intervention (and timepoints after partial crossover)
Funding statement	**Funding statement:** The author(s) disclosed receipt of the following financial support ~~for the research and/or authorship of this article: This work was supported by the~~ • National Health and Medical Research Council (NHMRC) of Australia [project grant number 191214, and Career Development Award number 307905 to L.M.C] • ~~; an~~ Australian Research Council Future Fellowship awarded to L.M.C. [number FT0992299]; • ~~the~~ National Stroke Research Institute of Australia • ~~and by~~ the Victorian Government's Operational Infrastructure

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	Support Program. ~~The funding sources had no role in conduct of the study or writing of the report~~ **Conflict of interest statement:** The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.
Notes	**Trial registration details:** Australian New Zealand Clinical Trials Registry (ACTRN012605000609651). **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; power calculations conducted were "~~power estimates were~~ based on our prior study investigating generalized training effects" .and ~~Outcome data were extracted at phase transitions to mimic the proposed design.~~ "The very large, standardized effect sizes indicated by that analysis (Cohen's d >5) yielded powers in excess of 99% for even quite small samples (eg, n = 20). Inclusion of 50 allowed for some attrition and investigation of therapeutic effects on a larger sample."

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomisation was computer generated with proportional sampling to control for side of lesion and gender
Allocation concealment (selection bias)	Low risk	Sequence of allocation was concealed from recruiting and treating therapists
Blinding (performance bias and detection bias) All outcomes	High risk	Blinding of outcome assessor but blinding of treatment providers was not guaranteed as therapists may have understood the difference between protocols
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants were included in the initial analysis
Selective reporting (reporting bias)	High risk	Secondary outcome measure was not reported and no additional paper was identified
Other bias	Low risk	Baseline demographic and clinical charactersitics of the groups were similar at baseline

Chen 2012 [5]	
Methods	**Design:** RCT **Country**: USA **Sense(s) addressed**: Vision

Participants	**Inclusion Criteria:** • first stroke during the past 6 months, with lesions in the right cerebral cortical or subcortical regions without involving the brain stem or any left-brain region; • no history of brain tumor, neurological disorder other than stroke, or brain injury followed by loss of consciousness. • right-handed, as determined by a 17-item handedness questionnaire • no difficulty in reading or using writing instruments within the arm-reach distance • no impairment in ocular vision indicated by medical records • deficits in visuospatial memory (immediate recall accuracy of Modified Taylor Complex Figure MTCF ≤ 9/36) **Exclusion Criteria**: see above **Study population (number randomised):** 11
Interventions	**Comparison: Active treatment 1 vs Active Treatment 2** **Active treatment 1** **Name:** image drawing - global processing training **Classification of intervention:** rehabilitation (restitution) **Materials:** Rey–Osterrieth Complex Figure, printed on 11 x 8.5 inch paper **Procedures:** Rey–Osterrieth Complex Figure **was** presented broken down into five subunits, moving from those presenting the global structure to the local details. Participants had to trace each using a pencil, being told to "please trace all the dashed lines on the paper." Upon completion, the examiner replaced it with the subsequent subunit. Once the entire complex figure was traced and easily visible at the presentation of the last subunit, it was replaced with a blank paper sheet, and participants were asked to reproduce the figure. This was repeated five times. **Who delivered:** not stated **Mode**: one-to-one **Where:** inpatient **Session:** 1 **Duration:** 90 mins **Tailoring:** no tailoring **Modification:** no modification **Active treatment 2** **Name:** image drawing - rote repetition training **Classification of intervention:** rehabilitation (restitution) **Materials:** Rey–Osterrieth Complex Figure, printed on 11 x 8.5 inch pape **Procedures:** a rote tracing exercise of the entire Rey–Osterrieth Complex Figure printed with dashed lines, repeated five times and receiving the same verbal instruction and producing the same number of drawings as the global processing training group **Who delivered:** not stated **Mode**: one-to-one **Where:** inpatient **Session: 1**

	Duration: 90 mins **Tailoring:** no tailoring **Modification:** no modification Participants in both groups continued with their regular physical and occupational therapy (one session of each per day) without interruption
Outcomes	**Perception:** Rey–Osterrieth Complex Figure, Modified Taylor Complex Figure, Medical College of Georgia Complex Figure 1 and Figure 2 **Timing:** immediately post intervention, 2 weeks, 4 weeks
Funding statement	**Funding statement:** "This work was supported by the Kessler Foundation and the Eunice Kennedy Shriver National Institute of Child Health & Human Development (1R03HD063177 to P.C.)" **Conflict of interest statement:** "None declared"
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Allocation via playing cards - blindly drew one of 16 cards without knowledge of any association
Allocation concealment (selection bias)	Low risk	Allocation was blinded
Blinding (performance bias and detection bias) All outcomes	High risk	Raters were blinded however examiners were not
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear if two lost participants were included in analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	The groups did not differ significantly at baseline, no other concerns noted

Cho 2015 [6]	
Methods	**Design:** RCT

	Country: South Korea **Sense(s) addressed**: vision
Participants	**Inclusion Criteria:** • hemiparalytic from a stroke within the previous 3 months to 1 year • able to follow verbal instructions • able to communicate at a certain level • able to perform all the tests and had experienced • cognitive function between 18 and 23 on the mini mental state examination (MMSE) **Exclusion Criteria**: • diplegia • never attended school • was biased • or had experienced Neurofeedback within the past year. **Study population (number randomised):** unclear - 27 "eventually completed the intervention and testing"
Interventions	**Comparison:** Active treatment vs no intervention **Active treatment 1** **Name:** Neurofeedback (NFB) training **Classification of intervention:** rehabilitation (restitution) **Materials:** NeuroComp System (Neurocybernetics Inc., Encino, CA, USA), composed of a repeater, a monitor for the clinician and the patient, computer, electroencephalography (EEG) sensor, cables, and poles. **Procedures:** NFB poles were attached to the scalp, and data were recorded on an oscillograph. The location of the poles followed the International 10–20 Electrode System, and the distance between each pole was 10–20% of the whole circumference; the NFB training method used was a beta-SMR method a with the patient's eyes open. For monopolar type training, a pole or NFB sensor was attached to the scalp within the lesion area, and the remaining 2 poles attached to both ears with the participant seated on a comfortable chair. The patient played 4 games, displayed on the monitor (including Space Race, Mazes, Island, and Boxlight), for example the Space Race game, the spaceship was set to move forward and backward depending on his/her level of brain wave activation. **Who delivered:** not reported **Mode**: one-to-one **Where:** inpatient **Session:** 30 mins, 5x week **Duration:** 6-9 weeks **Tailoring:** the location of poles was tailored to the patient's lesion. **Modification:** none stated Both groups received occupational and physical therapy for half an hour 5 times a week for 6 weeks. The NFB group received the same number of traditional rehabilitation sessions as the control group with extra NFB training
Outcomes	**Perception:** Motor free visual perception test (MVPT) **Other:** Brain waves - electroencephalography (EEG)

	Timing: immediately post intervention	
Funding statement	**Funding statement:** none given **Conflict of interest statement:** none given	
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	It is unclear how many participants were initially recruited
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Unclear risk	No commentary on any baseline differences between groups

Choi 2108 [7]	
Methods	**Design:** RCT **Country**: South Korea **Sense(s) addressed**: vision. Study also addresses postural balance and walking. **Study recruitment and setting details:** see Table 1
Participants	**Inclusion Criteria:** • at least a year after first stroke; • mini-mental state examination (MMSE)32 score >24oints • motor-free visual perception test-3 (MVPT3) score < 45 points • ability to understand instructions • ability to stand for 30 minutes independently • no spatial neglect.

	Exclusion Criteria: • prescribed drugs that affect balance • diagnosed with orthopedic diseases, such as arthritis, fracture, and low back pain • receiving parallel treatments in other medical institutions, such as moxa and acupuncture treatments • those with cerebellar or vestibular dysfunction • visual problem, such as glaucoma, cataract, and double vision **Study population (number randomised): 28**
Interventions	**Comparison: active treatment 1 vs active treatment 2** **Active treatment 1** **Name:** Wii Fit virtual reality training (WVRT) **Classification of intervention:** rehabilitation (restitution) **Materials:** Wii Fit Plus software and Wii Balance Board System (Nintendo Co. Ltd, Kyoto, Japan) **Procedures:** composed of six games, selected on the basis of interest, motivation, and difficulty level. The difficulty level of a game was gradually increased to require more multidirectional movement in the center of mass. The first stage (1–2 weeks) program consisted of tightrope walking and soccer heading, in which the center of mass shifted to the left and right. The second stage (3–4 weeks) program consisted of the penguin slide and ski slalom, requiring forward and backward weight transfer in addition to left and right weight transfer. The third stage (5–6 weeks) program consisted of the snowboard slalom and table tilt, requiring multidirection weight shifting **Who delivered:** physical therapist (with more than 3 years experience) **Mode**: one-to-one **Where:** inpatient **Session:** 30 mins, 5x week **Duration:** 6 weeks **Tailoring:** unclear - it is not clear if the level of training difficulty increased at a set rate, or in relation to individual performance **Modification:** none stated **Active treatment 1** **Name:** general balance training **Classification of intervention:** rehabilitation (restitution) **Materials:** a board of the same dimensions (51x27x5 cm) as the Wii Fit balance board; a mirror **Procedures:** the subject stood on the board on a board and asked and to look at their image in a mirror placed 2 m away. In the first stage (1–2 weeks), the patients had to transfer their body weight in the left and right directions while standing in front of the mirror. The second stage (3–4 weeks) required forward and backward weight shifting in addition to left and right weight shifting. In the third stage (5–6 weeks), weight shifting was carried out by placing a square plate on top of the head of patients to facilitate control of the multidirectional fine weight transfer **Who delivered:** not stated **Mode**: one-to-one

	Where: inpatient **Session:** 30 mins, 5x week **Duration:** 6 weeks **Tailoring:** none stated **Modification:** none stated Both groups received conventional physical and occupational therapy for 90 minutes, five times a week for 6 weeks.	
Outcomes	**Perception:** Motor Free Visual Perception test **Motor:** Berg balance Scale **Mobility & Navigation:** 10m Walking Test, Timed up and Go **Timing:** 1 week after intervention, 8-week follow up	
Funding statement	**Funding statement:** "this work was supported by Sahmyook University, and this research was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2017 R1D1A1B03035018)." **Conflict of interest statement:** "No competing financial interests exist."	
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported Study is a 'pilot' RCT but no further detail on this is given; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number table used
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	High risk	Blinded assessors. Participants may have spoken to one another minimising masking. Unclear if treating therapists were blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	No significant differences between groups, no other

		concerns noted
De Bruyn 2018 [8]		
Methods	**Design:** Multi-centre RCT **Country**: Belgium **Sense(s) addressed**: Somatosensory function	
Participants	**Inclusion Criteria:** Within 8 weeks of first stroke, <52/57 ARAT, sensory composite score of <0.00, 18 yrs+ **Exclusion Criteria**: Other neurological or musculoskeletal disorders affecting upper limb, severe cognitive or communication deficit, contraindications to MRI **Study population (number randomised):** 30	
Interventions	**Comparison: Active Intervention 1 vs Active intervention 2** **Active treatment 1** **Name:** Sensorimotor group in addition to conventional rehabilitation **Classification of intervention:** Rehabilitation (restitution) **Materials:** Different textures (fabric, wallpaper, plastic & sandpaper), different objects of varying shape, size and materials **Procedures:** 30 min of sensory retraining based on the SENSe training program and 30 min somatosensory integrated motor exercises including texture discrimination; limb position sense; and tactile object recognition. **Who delivered:** Therapist **Mode**: One to one **Where:** In-patient **Session:** 16 training sessions in addition to conventional rehabilitation **Duration:** 1 hour each (16 hours) over 4 weeks **Tailoring:** Not reported **Modification:** Not reported Does normal therapy continue? Yes **Active treatment 2** **Name:** Motor group in addition to conventional rehabilitation **Classification of intervention:** Rehabilitation (restitution) **Materials:** Different textures (fabric, wallpaper, plastic & sandpaper), different objects of varying shape, size and materials **Procedures:** 30 min of cognitive and attention-based tabletop games and 30 min of motor training. The cognitive attention-based therapy consisted of tabletop games such as chess, rush hour, or other smart games, all performed with the unaffected upper limb. 30-min motor arm training based on a set of standardized exercises including task-related practice for gross movements and dexterity including different grips and selective finger movements, and training in daily life activities, however without any attention to sensory discrimination training. **Who delivered:** Therapist **Mode**: One to one **Where:** In-patient	

	Session: 16 training sessions in addition to conventional rehabilitation **Duration:** 1 hour each (16 hours) over 4 weeks **Tailoring:** Individually tailored motor therapy including a unilateral motor exercise program for the affected upper limb **Modification:** Not reported Does normal therapy continue? Yes
Outcomes	**Category:** **Perception:** Erasmus modified Nottingham sensory assessment, Perceptual Threshold of Touch, Texture Discrimination Test, Wrist Position Sense Test, Functional Tactile Object Recognition Test **Adverse events:** number **Motor:** Action Research Arm Test, Fugl-Meyer Upper Extremity, Stroke Upper Limb Capacity Scale
Funding statement	**Funding statement:** This work was supported by Flanders Research Fund (FWO) (1189819N and 1519719N). **Conflict of interest statement:** The authors report no competing interests.
Notes	**Trial registration details:** NCT03236376 **Published protocol:** 2018 **PPI:** none reported No statement on pilot/feasibility design; no power calculation reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Block randomisation
Allocation concealment (selection bias)	Low risk	Allocation concealed with opaque envelopes
Blinding (performance bias and detection bias) All outcomes	High risk	Not reported for performance bias. Blinding of the assessor was not always achieved due to participant reaction
Incomplete outcome data (attrition bias) All outcomes	High risk	3 participants were excluded from both primary and follow up analysis
Selective reporting (reporting bias)	High risk	3 outcome measures were not fully reported
Other bias	High risk	Participants in the experimental group were significantly older and had more right hemispheric lesions

Edmans 2000 [9]	
Methods	**Design:** RCT **Country**: UK **Sense(s) addressed**: vision
Participants	**Inclusion Criteria:** • admitted to the Stroke Unit • perceptual problems - a RPAB.score two standard deviations or more below the mean on four or more subtests (assessed within 2 weeks of admission Note: participants were assessed for an evaluation study prior to consideration for the RCT. The criteria for this were: • medically stable • able to transfer with a maximum of two nurses • no discharge date planned • able to tolerate 30- minute treatment sessions • able to do two out of four specified activities (able to eat, able to drink, able to wash their face and able to toilet themselves) **Exclusion Criteria**: • not well enough to be assessed on the Rivermead Perceptual Assessment Battery (RPAB)(being able to see and hear; being able to understand the English language enough to complete the assessments and follow the instructions; being free of marked psychiatric problems that would affect their ability to complete the RPAB • sufficient functional use of one hand to complete the RPAB and to carry out perceptual treatment activities, i.e. sufficient ability to pick up and move objects/cards with one hand. **Study population (number randomised):** 80
Interventions	**Comparison: Active Treatment 1 vs Active Treatment 2** **Active treatment 1** **Name:** Transfer of training perceptual treatment **Classification of intervention:** Rehabilitation (restitution) **Materials:** not reported **Procedures:** not reported **Who delivered:** occupational therapist **Mode**: one-to-one **Where:** inpatient (Stroke Unit) **Session:** unclear, 2.5 hours in total **Duration:** 6 weeks **Tailoring:** not reported **Modification:** none reported **Active treatment 1** **Name:** Functional perceptual treatment **Classification of intervention:** Rehabilitation (compensation) **Materials:** not reported **Procedures:** not reported

	Who delivered: occupational therapist **Mode**: one-to-one **Where:** inpatient (Stroke Unit) **Session:** unclear, 2.5 hours in total **Duration:** 6 weeks **Tailoring:** not reported **Modification:** none reported Intervention was "in addition to their general OT treatment".
Outcomes	**ADL:** Barthel ADL Index, Edmans ADL Index **Perception:** Rivermead Perceptual Assessment Battery **Motor:** Rivermead Motor Assessment Gross Function Scale **Other:** length of stay, OT attendances, OT treatment time, **Timing:** Immediately after treatment
Funding statement	**Funding statement:** "We would like to thank the Stroke Association for funding this study, through a project grant to JA Edmans." **Conflict of interest statement:** none reported
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported. *Personal communication and primary data provided by Dr Edmans*

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number tables
Allocation concealment (selection bias)	Low risk	Personal communication. Dr Edmans prepared sequentially numbered, sealed envelopes, opened at recruitment with witness. Not adequate in that researcher prepared list, but assessed as low risk of bias from assurance of inability to remember sequence
Blinding (performance bias and detection bias) All outcomes	High risk	Intended independent assessor for outcomes covered by this review, but not reported success
Incomplete outcome data (attrition	Low risk	No withdrawals and only one (1%) death

bias) All outcomes		
Selective reporting (reporting bias)	Low risk	Outcomes described at both impairment and disability levels, and reported in equal detail regardless of statistical significance
Other bias	Low risk	No statistically significant differences between the two groups and no other concerns noted
Kang 2009 [10]		
Methods	**Design:** pilot RCT **Country**: South Korea **Sense(s) addressed**: vision	
Participants	**Inclusion Criteria:** • left hemiplegia after stroke (infarction or haemorrhage) on right middle cerebral artery territory • Mini-Mental State Examination >18 points • Motor Free Visual Perception Test standard score <109 **Exclusion Criteria**: • significant multiple small lacunar infarct • significantly decreased visual acuity or visual impairment from diabetic retinopathy or senile cataract • hearing difficulty or cranial nerve dysfunction **Study population (number randomised):** 16	
Interventions	**Comparison:** active treatment 1 vs active treatment 2 **Active treatment 1** **Name:** Computerized visual perception rehabilitation with motion tracking **Classification of intervention:** rehabilitation (restitution) **Materials:** **Procedures:** All the tasks were performed with the patients in a relaxed seated position in front of the monitor, with an interactive patient– computer interface. Motion-tracking technology, using the CAMSHIFT (continuously adaptive mean shift) algorithm, was used to recognize and track the hand motions of patients through a computer camera, and display these movements on the computer screen. It was programmed to show visual images of various tasks on the computer screen, and the patients were asked to perform these tasks with their hand instead of a computer mouse. Twelve tasks were designed to improve visual perceptual function: (1) visual reactions (2) visual differential reactions, (3) visual tracking and targeting and (4) visual spatial and motor challenges and were comparable to the similar groupings of the Foundation and Visuospatial parts of the PSS CogRehab program. **Who delivered:** Occupational Therapist **Mode**: one-to-one **Where:** inpatient **Session:** 30 mins, 3 x week **Duration:** 4 weeks	

	Tailoring: none reported **Modification:** none reported **Active treatment 2** **Name:** Computer-based cognitive rehabilitation program **Classification of intervention:** rehabilitation (restitution) **Materials:** Foundation and Visuospatial sections of PSS CogRehab software (Psychological Software Service, USA) **Procedures:** They performed the tasks with the right (not hemiplegic) hand. No other detail given **Who delivered:** Occupational Therapist **Mode**: one-to-one **Where:** inpatient **Session:** 30 mins, 3 x week **Duration:** 4 weeks **Tailoring:** none reported **Modification:** none reported Does normal therapy continue? Not stated, but likely to giving the inpatient setting
Outcomes	**ADL:** Modified Barthel Index **Perception:** Motor-free Visual Perception Test **Cognition**: Modified Mental State Examination **Other:** Interest in intervention questionnaire **Timing:** immediately after intervention
Funding statement	**Funding statement:** none reported **Conflict of interest statement:** none reported
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported Stated to be a pilot study; no power calculation reported.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Block randomisation process
Allocation concealment (selection bias)	Unclear risk	Not enough detail provided to establish if concealment was achieved
Blinding (performance bias and detection bias) All outcomes	High risk	Evaluators and data analysts were blinded however subjects and treating therapist were not

Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in the analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	No significant differences between the two groups, no other cause for concern noted

Kim 2015 [11]	
Methods	**Design:** RCT **Country**: South Korea **Sense(s) addressed**: Tactile
Participants	**Inclusion Criteria:** (1) experienced a unilateral stroke at least 6 months post event or more (2) able to maintain a standing position on the balance mat over 30 seconds (3) capable of standing without any assistance over 30 seconds (4) not training in any interventions from other institutions (5) sufficient cognition to participate in the training, that is, a Mini-Mental State Exam (MMSE) score of 24 or higher (6) Semmes-Weinstein monofilaments test, size up to 5.07 discrimination of the foot pressure. **Exclusion Criteria**: (1) any comorbidity or disability other than the stroke that precludes training (2) any uncontrolled health conditions for which training is contradicted. **Study population (number randomised):** unclear, but data for 30 participants was analysed
Interventions	**Comparison (across 3 arms): active treatment 1 vs active treatment 2 vs no treatment** **Comparison in Kim 2015 (stable): active treatment 1 vs no treatment** **Comparison in Kim 2015 (unstable): active treatment 2 vs no treatment** **Active treatment 1** **Name:** Pressure sense perception training on stable surface **Classification of intervention:** Rehabilitation (restitution) **Materials:** stable foam (50 cm × 41 cm × 6 cm) **Procedures:** Participants were asked to keep both feet parallel and to forward weight shift in the standing position. Participants were then asked to shift weight forward to the more affected side. After weight shifting, this position was maintained for 5 seconds. When the participants were tired, they had a break of 3 minutes in the sitting position. The forefoot on both sides was attached to foam (equal to the height: weight ratio). Pressure was measured into the heel in order to avoid compensatory plantar flexion.

	Knee joint of the more affected side showed slight flexion. Immediately after the subject's response, verbal feedback was given if the participant failed to test reproduce the required pressure. Each training session was performed step by step. **Who delivered:** Physiotherapist **Mode**: one-to-one **Where:** hospital (inpatient or outpatient unclear) **Session:** 30 mins, 3x per week **Duration:** 4 weeks **Tailoring:** Before training, participants were measured both at minimum and maximum pressure. Minimum pressure was measured when training in a standing position. Maximal pressure was measured when training position with weight bearing to affected side. Therapists set up the target weight which was between minimum pressure and maximum pressure. Stage 1 was trained by pressing the scales lower than the average of the minimum and maximum pressure. Stage 2 was trained by pressing the scales higher than the average of the minimum and maximum pressure. In case that the error from the target weight was within 1kg, it was marked as 60% successful and proceeded to the next stage **Modification:** none reported **Active treatment 2** **Name:** Pressure sense perception training on unstable surface **Classification of intervention:** Rehabilitation (restitution) **Materials:** balance pad **Procedures:** Participants were asked to keep both feet parallel and to forward weight shift in the standing position. Participants were then asked to shift weight forward to the more affected side. After weight shifting, this position was maintained for 5 seconds. When the participants were tired, they had a break of 3 minutes in the sitting position. The forefoot on both sides was attached to the balance pad (equal to the height: weight ratio). Pressure was measured into the heel in order to avoid compensatory plantar flexion. Knee joint of the more affected side showed slight flexion. Immediately after the subject's response, verbal feedback was given if the participant failed to test reproduce the required pressure. Each training session was performed step by step. **Who delivered:** Physiotherapist **Mode**: one-to-one **Where:** hospital (inpatient or outpatient unclear) **Session:** 30 mins, 3x per week **Duration:** 4 weeks **Tailoring:** Before training, participants were measured both at minimum and maximum pressure. Minimum pressure was measured when training in a standing position. Maximal pressure was measured when training position with weight bearing to affected side. Therapists set up the target weight which was between minimum pressure and maximum pressure. Stage 1 was trained by pressing the scales lower than the average of the minimum and maximum pressure. Stage 2 was trained by pressing the scales higher than the average of the minimum and maximum pressure. In case that the error from the target weight was within 1kg, it was marked as

	60% successful and proceeded to the next stage. **Modification:** none reported **No treatment** **Name:** n/a **Materials:** n/a **Procedures:** n/a **Who delivered:** n/a **Mode**: n/a **Where:** n/a **Session:** n/a **Duration:** n/a **Tailoring:** n/a **Modification:** n/a Does normal therapy continue? all groups receivd general physiotherapy alongside the trialled intervention "which included ordinary postural control exercises, such as maintenance of standing, and shift of the weight loads to both sides"	
Outcomes	**Mobility:** 10-meter test, Timed up and go **Perception:** pressure error (dynamometer) **Motor:** balancia, Functional Reach test, **Timing: i**mmediately after intervention (implied)	
Funding statement	**Funding statement:** none reported **Conflict of interest statement:** none reported	
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Table of random numbers used
Allocation concealment (selection bias)	Unclear risk	Not clear if there was adequate concealment
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in the analysis

Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	No significant differences between the two groups, no other concerns noted

Koo 2018 [12]	
Methods	**Design:** RCT **Country**: Korea **Sense(s) addressed**: Somatosensation
Participants	**Inclusion Criteria:** • within 1 month of their first-ever unilateral ischemic or hemorrhagic stroke • impairment in at least one of the pinprick, light touch, or proprioception parameters during a bedside screening evaluation • motor strength of the affected upper extremity at least grade 1 on the Medical Research Council Scale • sufficient cognitive function to follow simple commands (Mini-Mental State Examination score ≥20) **Exclusion Criteria**: • difficulty communicating and with aphasia or severe dysarthria • moderate to severe spasticity in all joints of the affected limb (Modified Ashworth Scale score≥2) • serious vision or visual perception impairments • history of diabetic neuropathy and/or other peripheral neuropathies • other severe psychologic, neuromuscular, or orthopaedic diseases. **Study population (number randomised):** 24
Interventions	**Comparison: Active treatment vs control** **Active treatment** **Name:** Anodal transcranial direct current stimulation **Classification of intervention:** non-invasive brain stimulation (NIBS) **Materials:** Iontophor II 6111 PM/DX with 2 conductive rubber electrodes placed in saline-soaked sponges (5x5cm^2) **Procedures:** The electrodes were placed according to the international 10–20 electroencephalogram system. For right cerebral hemisphere stroke, the anodal electrode was placed over the right S1 (CP4) and S1 (CP3) for left. The reference electrode was placed above the contralateral supraorbital region. The stimulation intensity was 1 mA. **Who delivered:** Experimenter **Mode**: Not reported **Where:** Inpatient **Session:** 10 sessions **Duration:** 20 minutes per session for 10 days **Tailoring:** Not reported **Modification:** Not reported

	Does normal therapy continue? Not reported **Control** **Name:** Sham stimulation **Materials:** Iontophor II 6111 PM/DX with 2 conductive rubber electrodes placed in saline-soaked sponges (5x5cm^2) **Procedures:** The electrodes were placed according to the international 10–20 electroencephalogram system. For right cerebral hemisphere stroke, the anodal electrode was placed over the right S1 (CP4) and S1 (CP3) for left. The reference electrode was placed above the contralateral supraorbital region. To mimic the skin sensation experienced at the initiation of anodal stimulation, the stimulator was programmed to ramp up over 10 secs and immediately ramp down to 0 mA over 10 secs. **Who delivered:** Experimenter **Mode**: Not reported **Where:** Inpatient **Session:** 10 sessions **Duration:** 20 minutes per session for 10 days **Tailoring:** Not reported **Modification:** Not reported	
Outcomes	**Category:** **ADL:** Korean version of modified Barthel index **Mobility and Navigation:** Functional Ambulation Category **Perception:** Erasmus MC modifications to the revised Nottingham Sensory Assessment, Stereognosis Subscale, **Adverse events:** number **Motor:** Manual Function Test, Brunnstrom Classification **Sensory:** Semmes-Weinstein monofilament examination	
Funding statement	**Funding statement:** Financial disclosure statements have been obtained **Conflict of interest statement:** No conflicts of interest have been reported by the authors or by any individuals in control of the content of this article.	
Notes	**Trial registration details:** The study was registered in the Korean Clinical TrialsRegister (KCT0002496) **Published protocol:** Not reported **PPI:** none reported "Because of the lack of previous studies, it was difficult to calculate the appropriate sample size."	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Simple randomisation but no further details provided
Allocation concealment (selection bias)	Unclear risk	No information provided

Blinding (performance bias and detection bias) All outcomes	Unclear risk	Examiners were blinded but masking of treatment providers not reported. Participants were blinded via use of a sham intervention
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in the analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	No significant difference in the general characteristics between the two groups, no other concerns noted
Lee 2021 [13]		
Methods	**Design:** RCT **Country**: Taiwan **Sense(s) addressed**: Somatosensation	
Participants	**Inclusion Criteria:** • First stroke with hemiplegia • subacute (3–6 mo) or chronic (>6 mo) stroke • could understand instructions • were in Brunnstrom Stages II–V of recovery • had sensory impairment (revised Nottingham Sensory Assessment [rNSA] Tactile score <2 and Kinesthetic score <3) • muscle tone allowing movement (Modified Ashworth Scale score <3) **Exclusion Criteria**: • ages <20 or >75 yr • unable to clearly see or hear the feedback from the device • other medical symptoms affecting movement **Study population (number randomised): 25**	
Interventions	**Comparison: Active treatment 1 vs Active treatment 2** **Active treatment 1** **Name:** Robot-assisted therapy **Classification of intervention:** Rehabilitation (restitution & substitution) **Materials:** Gloreha Sinfonia device - a glove that detects individual finger movement and supports practice of finger movement. The device focuses on the distal part of the upper limb with a dynamic support system to support the proximal part of the limb against gravity. Motor exercise is enriched by multisensory stimulation and the simultaneous display of 3D animation on a screen. **Procedures:** Warm-up included weight-bearing and rhythm activities. Robotic therapy consisted of 10 min of continuous whole-hand and individual-finger passive range of motion exercises with visual cues displayed on the screen and 30 min of active-assist activities which	

	included task-oriented bimanual activities and games. **Who delivered:** Occupational Therapist **Mode**: One to one **Where:** Outpatient **Session:** 12 sessions **Duration:** 60 minutes including 20 minutes warm-up and 40 minutes robotic therapy **Tailoring:** Settings adjusted according to participants ability **Modification:** Not reported Does normal therapy continue? No **Active treatment 2** **Name:** Conventional therapy **Classification of intervention:** Rehabilitation (restitution) **Materials:** Not reported **Procedures:** Warm-up included weight-bearing and rhythm activities. Conventional therapy consisted of task-oriented bilateral hand, grasp-and-release, and pinch activities **Who delivered:** Occupational Therapist **Mode**: One to one **Where:** Outpatient **Session:** 12 sessions **Duration:** 60 minutes including 20 minutes warm-up and 40 minutes conventional therapy **Tailoring:** Not reported **Modification:** Not reported	
Outcomes	**Category:** **ADL:** Modified Barthel Index **Perception:** rNSA Kinesthetic subtest **Adverse Events:** number **Motor:** Fugl-Meyer Assessment, grip dynamometer, Box and Block Test **Sensory:** Semmes–Weinstein hand monofilament, **Other:** surface electromyography, **Timing:** immediately after intervention	
Funding statement	**Funding statement:** This research was supported by the study projects of Taipei Medical University Shuang Ho Hospital (106 SHH HCP-11) **Conflict of interest statement:** Not reported	
Notes	**Trial registration details:** Not reported **Published protocol:** Not reported **PPI:** none reported A power calculation performed for a previous study indicated that 23 participants per group would provide 80% power with an ∝. of .05 to detect a within-groups difference in FMA–UE scores	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	Simple randomisation via a computer programme
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Assessors were blinded but no information provided for detection bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	One participant's data was not included in the final analysis as they dropped out but an intention to treat analysis was conducted
Selective reporting (reporting bias)	Low risk	All outcome measures accounted for
Other bias	Low risk	No significant differences between groups in relation to demographic, clinical or EMG data, no other points of concern

Lincoln 1985 [14]	
Methods	**Design:** RCT **Country**: England **Sense(s) addressed**: Vision
Participants	**Inclusion Criteria:** not reported clearly deficits on the Rivermead Perceptual Assessment Battery - scores more than 2 SD below the mean normal score **Exclusion Criteria**: not reported **Study population (number randomised):** 33
Interventions	**Comparison:** active treatment vs control **Active treatment** **Name:** Perceptual Training **Classification of intervention:** rehabilitation (restitution) **Materials:** not detailed in full but included coloured squares, sticks, picture cards, dominoes, parquetry, perceptual games **Procedures:** Practice on perceptual tasks of the kind commonly used in occupational therapy departments. Simple perceptual activities included stick length sorting, picture lotto, colour matching squares and shape recognition games; moderately difficult activities included colour category sorting, cylinder sequencing and symmetry dominoes; difficult activities included 'what's in a square', space race game, parquetry mosaic and perceptual association lotto. **Who delivered:** Occupational Therapist (implied)

	Mode: one-to-one **Where:** inpatient (Rehabilitation Centre) **Session:** 60 mins, 4x per week **Duration:** 4 weeks **Tailoring:** yes: tasks were selected for content and difficulty on the basis of initial perceptual test performance. **Modification:** none stated **Control** **Name:** Conventional therapy **Materials:** not detailed in full but included games, craft materials, gardening materials **Procedures:** Practice on activities, not specifically designed to improve perceptual ability. They included activities to improve physical ability, games, craft and gardening. A simple game was Solitaire, and a moderately difficult one was battleships. **Who delivered:** Occupational Therapist (implied) **Mode**: one-to-one **Where:** inpatient (Rehabilitation Centre) **Session:** 60 mins, 4x per week **Duration:** 4 weeks **Tailoring:** yes: tasks were selected for content and difficulty on the basis of initial perceptual test performance. **Modification:** none stated Does normal therapy continue? Normal OT therapy continued for both groups, focussing on gross motor performance.
Outcomes	**ADL:** Rivermead ADL scale **Perception:** Rivermead Perceptual Assessment battery **Timing:** immediately after intervention
Funding statement	**Funding statement:** We thank...Oxford Regional Health authority for financial support" **Conflict of interest statement:** none reported
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported. Personal communication with the original author

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No detail beyond "patients were randomly allocated"
Allocation concealment	Unclear risk	No information on process

(selection bias)		
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Blinded outcome assessment, but no details provided of performance bias
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not clear if all participants were included in analysis
Selective reporting (reporting bias)	Low risk	No suggestion of unreported outcomes
Other bias	Unclear risk	Original eligibility criteria restricted entry to right-hemisphere stroke patients. Later extended to head injury, subarachnoid haemorrhage and left hemisphere stroke "to obtain reasonable numbers within the time". Not clear what interim analyses were undertaken, and possible consequences for interpretation of the final data
Park 2015 [15]		
Methods	**Design:** RCT **Country**: South Korea **Sense(s) addressed**: vision	
Participants	**Inclusion Criteria:** We screened the volunteers by using the following study criteria derived from a previous CBCR study): • history of no more than one stroke; • stroke with an onset duration of • a score of ≤23 on the Korean version of Mini-Mental Status Examination (K-MMSE); • ability to understand instructions; • ability to use the controller with the unaffected upper limb • without unilateral hemispatial neglect and hemianopsia **Exclusion Criteria**: none stated **Study population (number randomised):** 30	
Interventions	**Comparison: active treatment 1 vs active treatment 2** **Active treatment 1** **Name:** Computer-based cognitive rehabilitation training (CoTras) **Classification of intervention:** rehabilitation (restitution) **Materials:** CoTras training program, with joystick and large button on the CoTras panel **Procedures:** "CoTras consists of a diverse training program including visual perception, attention, memory, orientation, and others (categorization,	

	sequencing). A joystick and a large button on the CoTras panel make the training easy for patients who are unfamiliar with computer use". No further detail given. Subjects received the visual perception training consisting of object recognition, object constancy, figure-ground organization, visual discrimination, and visual organization **Who delivered:** not reported **Mode**: one-to-one **Where:** hospital (outpatient/inpatient not clear) **Session:** 30 mins, 5x week **Duration:** 4 weeks **Tailoring:** "the training allows adjusting to individual patient's abilities at all levels of the program" and it is assumed this tailoring was done for participants **Modification:** none reported **Active treatment 2** **Name:** conventional cognitive rehabilitation **Classification of intervention:** rehabilitation (restitution) **Materials:** pencil and paper **Procedures:** conventional cognitive rehabilitation with a pencil and paper with emphasis on visual perception ability **Who delivered:** not reported **Mode**: not reported, likely one-to-one **Where:** hospital (outpatient/inpatient not clear) **Session:** 30 mins, 5x week **Duration:** 4 weeks **Tailoring:** none reported **Modification:** none reported Does normal therapy continue? Yes: "all subjects participated in a standard rehabilitation program according to a daily inpatient treatment schedule"	
Outcomes	**Perception:** Motor free visual perception test **Cognition**: Lowenstein Occupational Therapy Cognitive Assessment **Timing:** Immediately after intervention	
Funding statement	**Funding statement:** none reported **Conflict of interest statement:** none reported	
Notes	**Trial registration details:** none reported **Published protocol:** none reported **PPI:** none reported No statement on pilot/feasibilty design; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table used

Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Unclear risk	Unclear if the two groups differed at baseline
Seim 2021 [16]		
Methods	**Design:** Feasibility RCT **Country**: USA **Sense(s) addressed**: Tactile	
Participants	**Inclusion Criteria:** • History of stroke > 1 year prior • Impaired touch sensation in the hand (Semmes-Weinstein monofilament exam score of ≥ 0.2 grams on 3 of 20 measured locations on the hand) • Passive range of motion allows user to don a glove • English speaker, age 18+ **Exclusion Criteria**: • Intact sensation in the hand (determined by Semmes-Weinstein monofilament exam) • Active Range of Motion within normal limits for all joints of the fingers • Cognitive deficits, dementia or aphasia (MMSE score of <22) that prevent informed consent • Other neurological condition that may affect motor response (e.g. Parkinson's, ALS, MS) • Pain in the limb that substantially interferes with ADLs or prior arm injury • Enrolment in a conflicting study, Botox treatment, or other upper extremity rehabilitation program during the study period **Study population (number randomised):** 16	
Interventions	**Comparison: Active treatment vs Control** **Active treatment** **Name:** Vibrotactile stimulation Glove **Classification of intervention:** Rehabilitation (restitution)	

	Materials: A wearable computing glove providing vibrotactile stimulation. A vibration motor was attached to each dorsal phalanx allowing a designated actuator for each finger while stimulating a region where vibrations can reach the glabrous skin of the palm and the finger extensor tendons. A circuit board and microcontroller activates motors in a pre-programmed sequence when the switch is turned "on." Small, coin-shaped vibration motors from Precision Microdrives (ERM-type, Model #310-113) provide the stimulation. **Procedures:** Stimulation transmitted at a frequency range of 10-400 Hz (ideally 250Hz). Stimulation pattern and timing was designed to be intensive but not uncomfortable by using many vibration pulses with a changing location across the fingers. Vibration motors were driven at a voltage of 3.3V for an approximate amplitude of 1.5 g and 210 Hz vibration frequency (measured in a laboratory setting for validation at 1.3 g and 175 Hz when attached to the glove). Two stimulation sequences were used, each based on the finger pattern for a piano song which provided a framework for pseudo-random stimulation. The protocol includes no required exercises. **Who delivered:** Self-delivery **Mode**: Not reported **Where:** Patient's home **Session:** 56 sessions (daily for 8 weeks) **Duration:** 3 hours per day for 8 weeks (21 hours per week) **Tailoring:** Not reported **Modification:** Not reported Does normal therapy continue? Participants continued their standard of care **Control** **Name:** Sham **Materials:** A wearable computing glove **Procedures:** Participants in the sham control condition receive a glove with vibration disabled. They were instructed to wear the glove on their affected hand, switched on, for three hours daily while awake **Who delivered:** Self-delivery **Mode**: Not reported **Where:** Patient's home **Session:** 56 sessions (daily for 8 weeks) **Duration:** 3 hours per day for 8 weeks (21 hours per week) **Tailoring:** Not reported **Modification:** Not reported
Outcomes	**Category:** **Motor:** Voluntary angular range of motion **Sensory:** Semmes–Weinstein Monofilament Exam **Other:** Modified Ashworth Scale
Funding statement	**Funding statement:** This research was supported, in part, by the National Science Foundation (NSF) Graduate Research Fellowship program, a grant from the Georgia Tech Graphics, Visualization, and Usability (GVU) consortium, and a Microsoft Research PhD Fellowship. **Conflict of interest statement:** The authors declare that they have no competing interests.

Notes	**Trial registration details:** As a feasibility study, the trial was not listed with clinicaltrials.gov **Published protocol:** No **PPI:** none reported No statement on pilot/feasibility design; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Outcome assessors blinded and sham intervention used. Not clear if treatment providers were blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in analysis
Selective reporting (reporting bias)	Low risk	All outcomesa measures reported
Other bias	Unclear risk	No information provided on baseline differences, no other concerns noted
Yang 2015 [17]		
Methods	**Design:** Pilot RCT **Country**: Taiwan **Sense(s) addressed**: Somatosensation	
Participants	**Inclusion Criteria:** • Unilateral hemiparesis secondary to cerebrovascular accident confirmed by computerised tomography or magnetic resonance neuroimaging • greater than zero-point scores in each section of the scale for contraversive pushing (sitting plus standing) as defined by Baccini et al. • ability to follow simple verbal instructions **Exclusion Criteria**: • unstable medical conditions, such as severe heart attack and/or seizure • visual and/or auditory impairment	

	• history of other diseases known to interfere with study participation **Study population (number randomised):** 12
Interventions	**Comparison: active treatment 1 vs active treatment 2** **Active treatment 1** **Name:** Computer-generated interactive visual feedback training **Classification of intervention:** Rehabilitation (restitution) **Materials:** Nintendo Wii balance board (wireless model, connects to the training program on a personal computer) and a customized, interactive visual feedback training program (a LabVIEW-based software) **Procedures:** Prior to each training session, the program auto-checked the centre position of the Wii balance board along the frontal and sagittal axes, and sets the middle. A physical therapist helped each participant to sit or stand on the Wii balance board as symmetrically as possible and to adjust centre of pressure to the middle in as upright a posture as possible. The locations of the centre of pressure in the frontal, sagittal, and transverse planes were displayed real-time on a monitor while participants shifted their body weight in the medial-lateral, anterior-posterior, or oblique directions. Feedback included vertical body posture. **Who delivered:** Physiotherapist **Mode**: Not reported **Where:** Outpatient **Session:** 3 times per week for 3 weeks **Duration:** 40 minutes (20 minutes on computer + 20 minutes physiotherapy) **Tailoring:** Not reported **Modification:** Not reported Does normal therapy continue? Yes regular physical therapy (i.e. mat exercises and upper and lower extremity exercises) **Active treatment 2** **Name:** Mirror visual feedback training **Classification of intervention:** Rehabilitation (restitution) **Materials:** Whole-body mirror **Procedures:** The general training protocols used for the control group were the same as those used for the experimental group. **Who delivered:** Physiotherapist **Mode**: Not reported **Where:** Outpatient **Session:** 3 times per week for 3 weeks **Duration:** 40 minutes (20 minutes of mirror feedback training + 20 minutes physiotherapy) **Tailoring:** Not reported **Modification:** Not reported
Outcomes	**Category:** **Adverse events:** number **Motor:** Berg Balance Scale, Fugl-Meyer Assessment **Other:** Scale for Contraversive Pushing
Funding	**Funding statement:** This study is funded partly by grants from the National

statement	Science Council [NSC100-2314-B-010- 022-MY2] and the Ministry of Education, Aim for the Top University Plan [102AC-P508] of the Republic of China. **Conflict of interest statement:** The authors declare that there is no conflict of interest.	
Notes	**Trial registration details:** Not reported **Published protocol:** No **PPI:** none reported No statement on pilot/feasibility design; no power calculation reported.	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomly generated group allocation
Allocation concealment (selection bias)	Unclear risk	Use of a sealed envelope but no further details provided
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Assessors were blinded but no information provided for performance bias
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants included in analysis
Selective reporting (reporting bias)	Low risk	All outcome measures reported
Other bias	Low risk	No baseline differences, no other concerns noted
Yun 2018 [18]		
Methods	**Design:** RCT **Country**: Korea **Sense(s) addressed**: Somatosensation	
Participants	**Inclusion Criteria:** • patients diagnosed with lateropulsion, with a burke lateropulsion scale (BLS) score over 2 points after stroke • subacute stroke (unilateral ischemic or haemorrhagic stroke, duration after stroke <3 months) documented by computed tomography (CT) or magnetic resonance imaging (MRI)	

	Exclusion Criteria: • unable to walk before the stroke • significant cardiopulmonary disease, severe cognitive dysfunction, or musculoskeletal disease that might limit exercise participation **Study population (number randomised):** 38
Interventions	**Comparison: Active treatment 1 vs Active treatment 2** **Active treatment 1** **Name:** Robot-assisted gait training **Classification of intervention:** Rehabilitation (restitution & substitution) **Materials:** Lokomat **Procedures:** A harness, which is attached to the body-weight support system, was placed on the patient, the robot-driven gait orthosis was then positioned on the patient's hip and knee joints to adjust joint movements at individualized gait speeds. depending on the patient's functional level, levels of body-weight support, treadmill speed, and guidance force were adjusted to maintain the knee extensor on the weak side during the stance phase. initially, the guidance force was set to 100%. as function improved, the guidance force was decreased to 10%. the level of body-weight support steadily decreased from 50% to 0%. the treadmill speed (starting at 1.0 to 1.5 km/h) was increased by 0.2 to 0.4 km/h per session as soon as possible in accordance with the most comfortable gait for each patient. Augmented performance feedback was via virtual reality with game-like exercises. The avatar moves at the same time according to the patients' movement and performs repetitive tasks, such as avoiding obstacles and catching animals **Who delivered:** Not reported **Mode**: Not reported **Where:** Inpatient **Session:** 5 sessions per week for 3 weeks (15 sessions) **Duration:** 30 minutes per session **Tailoring:** all parameters were individually adjusted for each session **Modification:** Not reported Does normal therapy continue? Yes, in addition, both groups received conventional physiotherapy for 4 weeks after 15 sessions of intervention. The usual treatments for acute stroke patients, such as occupational therapy, cognitive and speech therapy, in the inpatient rehabilitation clinic of a tertiary hospital were performed equally in both groups according to the condition of each patient. **Active treatment 2** **Name:** Conventional physical therapy **Classification of intervention:** Rehabilitation (restitution) **Materials:** Not reported **Procedures:** Neurodevelopmental techniques developed by Bobath and physiotherapy proposed by Karnath et al. The focus is to enable weight transfer to the non-hemiparetic side and to perform upright activities and balance correction. Transfer, sit-to-stand training, and strengthening exercises, as function improved, functional gait training, including trunk stability exercise, weight support on the paretic leg, and step initiation. **Who delivered:** Physiotherapist

	Mode: Not reported **Where:** Inpatient **Session:** 5 sessions per week for 3 weeks (15 sessions) **Duration:** 30 minutes per session **Tailoring:** As function improved the programme was adjusted **Modification:** Not reported
Outcomes	**Category:** **ADL:** Korean version of modified Barthel Index **Motor:** Berg Balance Scale, Fugl-Meyer Assessment **Adverse Events:** number **Other:** Burke Lateropulsion Scale, Postural Assessment for Stroke, Somatosensory Evoked Potentials
Funding statement	**Funding statement:** This study was supported by Wonkwang University in 2018. **Conflict of interest statement:** The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript
Notes	**Trial registration details:** Not reported **Published protocol:** No **PPI:** none reported G*power (version 3.1.9.2, heinrich-heine-universität, düsseldorf, Germany) was used to calculate the required sample size.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomly allocated via use of numbered tickets
Allocation concealment (selection bias)	Unclear risk	Use of sealed envelopes but not clear if concealment was achieved
Blinding (performance bias and detection bias) All outcomes	Unclear risk	Not clearly reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Two participants (one from each group) were not included in the analysis, reasons provided were not linked to the intervention
Selective	Low risk	All outcome measures reported

reporting (reporting bias)		
Other bias	Low risk	No significant difference at baseline, no other cause for concern

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