Objective

To trial neuroscience-based SENSEe intervention to improve somatosensory discrimination function in children with hemiplegic cerebral palsy.

Rationale

Cerebral palsy (CP) is an umbrella term for an injury or malformation in the developing brain resulting in limitations in motor function and frequently accompanied by comorbidities such as impaired sensation, perception, cognition, communication and behaviour. Hemiplegia affects one side of the body and is the most frequently occurring distribution of motor impairment in children with CP. Children with hemiplegic cerebral palsy (HCP):

• commonly have impairments in somato/lymph/sensory discrimination with prevalence reported as high as 90% (1)
• reduced somatosensory discrimination contributes significantly to reduced motor function (2,3)
• somatosensory function is important for the retention of functional gains following motor based intervention (4)
• there are no evidence based interventions to improve somatosensory impairment for children with HCP (5).
• there are evidence based treatments available that have been found to improve sensory deficits and hand function in adults in the chronic phase post stroke (6,7).

Methods

This was a feasibility randomised control trial. Children were recruited through a Cerebral Palsy Mobility Service at a paediatric hospital in Perth, Western Australia.

Intervention

The experimental intervention (EI) is based on principles of learning dependent neural plasticity and a perceptual-learning approach. The EI aims to improve somatosensory discrimination, particularly tactile discrimination, haptic object recognition and proprioception and includes the integration of somatosensory cues into occupational goals set by participants. The EI is designed in levels of difficulty and participants’ progression through the training levels was logged. All participants were assessed using the SENSEe Assess Kids at baseline and 6 weeks later. The SENSEe Assess Kids consists of the Wrist Position Sense Test, Tactile Discrimination Test; and the Functional Tactile Object Recognition Test. In addition the Box and Block Test, Goal Attainment Scaling (GAS) and the Canadian Occupational Performance Measure (COPM) were used to quantify gross manual dexterity and activity participation.

Results

Progress through the treatment levels was mapped using the group median and is presented in Fig 1.

Each child’s individual change on the SENSEe Assess Kids from baseline to six weeks was calculated and expressed as a percentage.

Differences were not significantly different between groups due to the small number of participants. The treatment group set 17 goals using GAS and 13 of these were achieved to expected or greater than expected outcome, while none of the 12 goals set by the control group were achieved, see Fig 2.

Discussion

• This is the first study investigating an intervention to improve somatosensory discrimination function in children with HCP.
• We observed modest improvement in the EI group in somatosensory discrimination and gross manual dexterity.
• There were high levels of goal attainment in the experimental group, however the control group showed no change.
• Children in the experimental group progressed through treatment levels suggesting it is possible for children with impaired sensation to learn to distinguish between differences in somatosensory cues presented in a structured way.
• Intensive training of any kind can have positive effects on upper limb function and goal attainment, but this understanding was in the context of intensive training constituting 30 to 60 hours of practice.
• The EI group received 18 hours of somatosensory discrimination training, with occupational practice making up approximately 4 hours of the total training.
• The goal attainment of our experimental group with relatively few hours of practice compared with traditional motor learning input at 30-60hrs leaves room for optimism for the efficacy of this experimental somatosensory discrimination training.
• These early positive signs warrant further investigations with a larger sample.

Conclusions

We observed improvement in somatosensory discrimination in the treatment group. This improvement was not statistically significant but this is to be expected with small numbers. A high proportion of children in the treatment group also improved their gross manual dexterity and achieved the goals they had set compared with the control group. These data provide sufficient evidence to further explore sensory discrimination training for children with HCP.

References