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Introduction: Constraint induced movement therapy (CIMT) is well- documented and researched strategy and has demonstrated positive effect on children with hemiplegic cerebral palsy (CP). Children have shown increased active use of their affected upper limb and functional performance with long lasting effect. Moreover, self regulation (SR) is a strategy to help individuals to identify problems and derive solutions which is widely applied in improving performance on motor tasks as well as promoting relearning of functional tasks. Both CIMT and SR adopted same philosophy as conductive education, that is "unity of mind and body". The active learning brought about by SR combines with the active movement imposed by CIMT might help children with hemiplegic CP to improve functions of their affected limb. However, there is no study for applying CIMT and SR in school setting as CIMT traditionally engaged children's affected limb on intensive structured practice in laboratory, therapy room or campsite for three to six hours daily which involved intensive therapist-guided training. In addition, there are limited studies for children aged above eight-year-old and no published CIMT report in Hong Kong. Therefore, the effectiveness of a protocol combining modified CIMT (mCIMT) and SR, which incorporated daily routine practice with less intensity of structured practice, to children with hemiplegic CP studying at special school was studied.

Materials and Methods: Ten children diagnosed with hemiplegic CP with a mean age of 13.6 years (age 9 to 18 years) were involved. A within-subjects design was used with children acting as their own controls. All children underwent a three-week modified constraint-induced movement therapy plus self regulation (mCIMT + SR) program. A three-week no-treatment period was followed to measure carry-over effect. The mCIMT + SR program involved restraint of the unaffected upper limb of children using a cotton sling for 6 hours per day for 15 days. A one-hour structured taskpractice with the use of SR was provided during each 6-hour restraint. Subtest 5 and subtest 8 of the Bruininks–Oseretsky Test of Motor Proficiency, the Jebsen-Taylor Test of Hand Function, the Caregiver Functional Use Survey, a hand dynamometer, pinch gauge, and modified Ashworth scale were used for evaluation. Children were assessed once before and twice after the mCIMT + SR at 1 week and at 3 weeks. Repeated-measures ANOVA and paired t tests were used to analyze the data.

Results: Children showed significant improvements in upper limb coordination ($p=0.028$), speed and dexterty ($p=0.003$), quality use of upper limb ($p=0.005$) and hand strength ($p=0.032$), after receiving the mCIMT + SR program and these gains sustained for at least 3 weeks post treatment.

Discussion: The findings suggest that the mCIMT + SR program demonstrated effective outcomes in enhancing the upper limb function for school children with hemiplegic CP. The increased time

of practice during lessons and routine and use of SR during the structured practice were regarded as cost-effective. In order to benefit more children with hemiplegic CP, feasibility of using this protocol on children of different age, and/or mentality levels can be explored further.

Conclusion: Upper limb function of children with hemiplegic CP could be significantly improved by applying mCIMT and SR in school setting. The program, therefore, appeared to be a practical and cost-effective protocol for children studying in school-based setting.

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