'Current and future uses of the Gross Motor Function Classification System'

SIR–With its relative simplicity and yet reliability, it is not surprising that the Gross Motor Function Classification System (GMFCS) is in widespread use in research to categorize the gross movement function of children with cerebral palsy (CP); nevertheless I have some concerns.

There are reasons other than motor disability dictating whether a child achieves or fails to achieve an ability: for example, those children with CP who walk late primarily because they are late walkers, regardless of their CP.

Then there are the limitations imposed by having only five choices. I am reminded of the Oxford muscle strength scale (0–5), where there was a frequent need to add a plus or a minus, particularly to grades 3 and 4 (indeed, for greater accuracy, one polio clinic insisted we did). The Functional Mobility Scale[1] (with a three number score) uses 22 mobility grades (effectively a maximum of 8, 7 and 7 and a minimum of 8, 1 and 1) to describe just one aspect of function.

But as a reliable and widely accepted assessment tool for CP, does this matter? Perhaps, because it is so widely used that it is already becoming part of the description of a child's *motor disability*; similar to the way in which the *distribution within the body* of CP has become joined to the *motor disorder* in some classifications, where hemiplegic or diplegic *distribution* can be described only as '*spastic* hemiplegia' or '*spastic* diplegia'.

I am concerned that this misuse will extend into the teaching of intervention: 'For a GMFCS Level III diplegic child one would consider ...' and that this effective research and communication tool may become an all-too-convenient shorthand which masks the multitude of problems each child uniquely presents. Of course 'we all know' what the GMFCS is measuring and that (re)habilitation is never that simple, but there is a danger of it appearing to be so, not to the measure's designers, nor perhaps to those currently using it, but to the next generation. The fault will not lie with the measure but with its use. The shaft of a screwdriver needs only to resist torsion and some compression, but has to be made also to resist bending. Why? Because it is a convenient lever to open a tin of paint.

David Scrutton MSc MCSP

2 Bradbourne Road, Sevenoaks, Kent, UK.

Correspondence to: david.scrutton@talktalk.net

Reference

1. Graham HK, Harvey A, Rodda J, Nattrrass GR, Pirpiris M. The Functional Mobility Scale. *J Pediatr Orthop* 2004; **24:** 514–20.

'Both constraint-induced movement therapy and bimanual training lead to improved performance of upper extremity function in children with hemiplegia'

SIR–In recent years increasing attention has been afforded to the potential benefit of constraint-induced movement therapy (CIMT) as a means of improving upper extremity (UE) function in children with hemiplegia. Indeed, there is mounting evidence of treatment efficacy for some children with hemiplegia across a wide array of delivery methods, including various restraint types, treatment models, intensities and durations, as well as age.[1–3] Despite the success across the diversity of these studies, recently it has been suggested that treatment outcomes are compromised if the delivery method deviates from the methods typically used in adults, including use of a cast worn continuously for 3 weeks on the less-affected UE.[4] However, these claims are unsubstantiated as comparisons are based on caregiver surveys without established validity or reliability. Furthermore, treatment efficacy has been demonstrated with standardized measures using far less restrictive restraints (mitts) during just 2 hours per day.[5] In addition, we have demonstrated that improvements in UE function can be achieved during intensive bimanual training (i.e. without any restraint whatsoever).[6] However, currently it is not known whether distributing practice across both UEs is as beneficial or whether there may be short-term compromises in treatment outcome.

In the present study we compared the efficacy of CIMT and bimanual training using a quasi-randomized design (i.e. alternation assignment in groups of four children). Sixteen children (eight children in each treatment; age 3y 8mo–13y 7mo) with mild to moderate hemiplegic cerebral palsy were provided either CIMT or Hand-Arm Bimanual Intensive Therapy (HABIT).[7] All children met inclusion criteria and underwent procedures established in our earlier studies.[8] Informed consent was obtained from all children and their caregivers. The study was approved by Teachers College, Columbia University Institutional Review Board.

Briefly, the CIMT and HABIT interventions were provided one-on-one by trained interventionists 6 hours per day on 10 out of 12 consecutive days in a day-camp environment at our laboratory. Details of the intervention procedures are reported elsewhere.[7,9] Two standardized measures, the Jebsen-Taylor Test of Hand Function and the Assisting Hand Assessment (AHA), were used to assess hand function immediately before and after treatment. We also determined the percent time of affected UE use during performance of the AHA as measured by accelerometers. The assessments were administered by a blind evaluator.

Table I shows that similar improvements were demonstrated for each group from the pretest to the post-test in all three measures ($p<0.05$ in all cases). Specifically, there was a 16% and 13% decrease in time to complete the Jebsen-Taylor Test for the CIMT and HABIT groups respectively. Furthermore the AHA scores increased approximately 8% and the accelerometry scores increased approximately 16% for both treatment groups.

These findings are in agreement with our earlier studies that demonstrated efficacy for both treatments separately. This represents the first attempt to compare efficacy of constraint therapy and bimanual training. Here we show that the amount of improvement is not dependent on use of a restraint. These results give further credence to our argument that using an adult CIMT model is invasive and unnecessary to achieve UE gains.

Generally we espouse the belief that the goal of UE rehabilitation should be to increase functional independence by improving use of both hands in cooperation. Our results do not support the notion that this requires specificity of

Table I: Mean (SD) for each outcome measure

	Pretest	*Post-test*	*Significance*
Jebsen-Taylor Test of Hand Function(s)	CIMT: 499.6 (199.6) HABIT: 385.3 (153.3)	CIMT: 419 (245.2) HABIT: 334.2 (129.0)	$F(1,14)=6.566$, $p<0.02$, $eta^2=0.319$
Assisting Hand Assessment (scaled score)	CIMT: 45.1 (7.9) HABIT: 55.9 (7.0)	CIMT: 48.5 (10.9) HABIT: 60.5 (7.2)	$F(1,14)=12.904$, $p<0.003$, $eta^2=0.480$
Accelerometry (% use of involved upper extremity)	CIMT: 64.8 (13.5) HABIT: 64.9 (9.8)	CIMT: 74.9 (6.9) HABIT: 75.4 (7.0)	$F(1,14)=24.067$, $p<0.001$, $eta^2=0.632$

CIMT, constraint-induced movement therapy; HABIT, Hand-Arm Bimanual Intensive Therapy.

practice since both groups demonstrate similar improvement. One reason for this finding could be that that neither group practiced items in which they were later tested. Thus, both treatment groups were asked to generalize what they learn during testing, and the tests may not be sensitive to outcome differences in this regard. Several limitations should be noted. First, although the results were remarkably similar for both groups with medium to large effect sizes (Table I, eta^2), individuals with hemiplegia are a heterogeneous population, and thus a larger study is warranted. Second, the study used a quasi-randomized design, and thus a randomized study with stratification based on initial severity is merited. Finally, long-term retention of the reported gains are not known. Future stratified randomized trials are needed to home in on effects of severity, dose response, specificity of training, and retention in order to truly begin to unravel the key ingredients that lead to optimal UE treatment outcomes.

Acknowledgement
This work was supported by the Thrasher Research Fund.

Andrew M Gordon PhD[a,*]
Ashley Chinnan PT[a]
Simone Gill OT[a]
Electra Petra OT MA[a]
Ya-Ching Hung PT EdD[a]
Jeanne Charles PT MSW PhD[b]

[a]*Department of Biobehavioral Sciences, Teachers College, Columbia University, New York, NY;*
[b]*Division of Physical Therapy, Department of Rehabilitation Medicine, Emory University School of Medicine, Atlanta, GA, USA.*

**Correspondence to: ag275@columbia.edu*

References

1. Hoare BJ, Wasiak J, Imms C, Carey L. Constraint-induced movement therapy in the treatment of the upper limb in children with hemiplegic cerebral palsy. *Cochrane Database Syst Rev*, CD004149, 2007.
2. Eliasson AC, Gordon AM. Constraint-induced movement therapy for children with hemiplegia. In: Eliasson AC, Burtner P, editors. Improving Hand Function in Children with Cerebral Palsy: theory, evidence and intervention. Clinics in Developmental Medicine No. 178. London, Mac Keith Press, 2008.
3. Gordon AM, Friel K. Intensive training of upper extremity function in children with cerebral palsy. In: J Hermsdoerfer, DA Nowak, editors. Sensorimotor control of grasping: physiology and pathophysiology. Cambridge University Press [forthcoming].
4. Taub E, Griffin A, Nick J, Gammons K, Uswatte G, Law CR. Pediatric CI therapy for stroke-induced hemiparesis in young children. *Dev Neurorehabil* 2007; **10:** 3–18.
5. Eliasson AC, Krumlinde-Sundholm L, Shaw K, Wang C. Effects of constraint-induced movement therapy in young children with hemiplegic cerebral palsy: an adapted model. *Dev Med Child Neurol* 2005; **47:** 266–75.
6. Gordon AM, Schneider JA, Chinnan A, Charles JR. Efficacy of hand-arm bimanual intensive therapy (HABIT) in children with hemiplegic cerebral palsy: a randomized control trial. *Dev Med Child Neurol* 2007; **49:** 830–38.
7. Charles J, Gordon AM. Development of hand-arm bimanual intensive therapy (HABIT) for improving bimanual coordination in children with hemiplegic cerebral palsy. *Dev Med Child Neurol* 2006; **48:** 931–36.
8. Charles JR, Wolf SL, Schneider JA, Gordon AM. Efficacy of a child-friendly form of constraint-induced movement therapy in hemiplegic cerebral palsy: a randomized control trial. *Dev Med Child Neurol* 2006; **48:** 635–42.
9. Gordon AM, Charles J, Wolf SL. Methods of constraint-induced movement therapy for children with hemiplegic cerebral palsy: development of a child-friendly intervention for improving upper-extremity function. *Arch Phys Med Rehabil* 2005; **86:** 837–44.

'Non-syndromic encephalocele: a 26-year experience'

SIR–Neural tube defects are among the most frequent congenital malformations in infants. We carried out our investigations to examine the characteristics of the background of non-syndromic encephalocele in Hungary, as well as to compare with those of other publications emanating from different geographical origins. Encephalocele, accounting for almost 5% of all neural tube defects, is a hernioid protrusion of brain tissue and/or cerebral meninges through a pathological fissure in the skull (prevalence at birth is 0.63–2.5/1000; in Hungary 0.2–2.3/1000).[1–4]

We carried out investigations based on a computerized database into the sample of 115 cases of non-syndromic encephalocele diagnosed within our department during the period 1979 to 2005.

Maternal and paternal median ages were 24 years and 7 months (17–41y) and 29 years and 11 months (21–54y) respectively. The male:female ratio was 0.85:1 (53 males, 62 females). Obstetric or genetic complications in the history were found in 48.7% of the cases. Previous obstetric complications (29.6%) were more common than genetic malformations in the history (19.1%; $p<0.05$).

The median value of maternal serum AFP (1.85 multiples of the median [MoM]; 0.6–3.9 MoM) was in the normal range, while the sensitivity of this screening test was under 50% (46.2%).