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# CP Research News

Monday 14 July 2008

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## 1: Am J Phys Med Rehabil. 2008 Jul 9. [Epub ahead of print]

### Robotic Therapy and Botulinum Toxin Type A: A Novel Intervention Approach for Cerebral Palsy.

Fasoli SE, Fragala-Pinkham M, Hughes R, Krebs HI, Hogan N, Stein J.

From Spaulding Rehabilitation Hospital, Boston, Massachusetts (SEF, RH, JS); Harvard Medical School, Department of Physical Medicine and Rehabilitation, Cambridge, Massachusetts (SEF, JS); Franciscan Hospital for Children, Brighton, Massachusetts (MFP); Massachusetts Institute of Technology, Mechanical Engineering Department, Cambridge, Massachusetts (HIK, NH); Weill Medical College of Cornell University, Department of Neurology and Neuroscience, The Burke Medical Research Institute, White Plains, New York (HIK); Department of Neurology, University of Maryland School of Medicine, Baltimore, Maryland (HIK); and Massachusetts Institute of Technology, Brain and Cognitive Sciences, Cambridge, Massachusetts (NH).

Fasoli SE, Fragala-Pinkham M, Hughes R, Krebs HI, Hogan N, Stein J: Robotic therapy and botulinum toxin type A: a novel intervention approach for cerebral palsy. Am J Phys Med Rehabil 2008;87:000-000. The combined effects of robotic therapy and botulinum toxin type A (BTX-A) on upper-limb movement and function were studied in an 8(1/2)-yr-old child with hemiplegic cerebral palsy. Robotic therapy comprising repetitive, goal-directed reaching tasks was administered two times per week for 8 wks. Clinical measures included the Modified Ashworth Scale, the Quality of Upper Extremity Skills Test, and the Fugl-Meyer Assessment (upper-limb section). Improvements in upper-limb coordination and quality of motor performance were apparent throughout the robotic therapy trial. The observed gains are comparable with those attained from conventional occupational therapy combined with BTX-A. A parent questionnaire indicated that the amount of paretic arm use also improved during daily activities at home. This preliminary study indicates that robotic therapy may be a useful clinical tool when combined with BTX-A injections for improving upper-limb coordination and quality of motor performance in children with cerebral palsy.

PMID: 18617860 [PubMed - as supplied by publisher]



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**2: Neurology. 2008 Jul 8;71(2):122-8.**

**Two-year placebo-controlled trial of botulinum toxin A for leg spasticity in cerebral palsy.**

Moore AP, Ade-Hall RA, Smith CT, Rosenbloom L, Walsh HP, Mohamed K, Williamson PR.

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**BACKGROUND:** The controlled evidence favoring botulinum toxin A (BtA) treatment for spasticity in cerebral palsy is based on short-term studies. **METHODS:** We conducted a randomized, double-blind, placebo-controlled, parallel-group study of BtA (Dysport) for leg spasticity in 64 children with cerebral palsy. For 2 years, the children received trial injections of up to 30 mu/kg every 3 months if clinically indicated. **RESULTS:** For the primary endpoints of Gross Motor Function Measure (GMFM) and Pediatric Evaluation of Disability Index (PEDI) scaled scores at 2 years (trough rather than peak effect), there were no differences between the mean change scores of each group. For the GMFM total score, the 95% CI of -4.81 to 1.90 excluded a 5-point difference in either direction, and a 2-point benefit with 95% confidence. There were no differences in adverse events. **CONCLUSIONS:** There was no evidence of cumulative or persisting benefit from repeated botulinum toxin A (BtA) at the injection cycle troughs at 1 year or 2 years. The dose was not enough to change spasticity measures and thus GMFM in this heterogeneous group. Ceiling effects in GMFM and Pediatric Evaluation of Disability Index (PEDI) may have reduced responsiveness. This finding does not deny the value, individually, of single injection cycles or prove that repeating them is unhelpful. In this regard, BtA treatment can be viewed in the same light as other temporary measures to relieve spasticity, such as oral or intrathecal agents: there is no evidence of continuing benefit if the treatment ceases. The study provides long-term, fully controlled adverse event data and has not revealed any long-term adverse effects.

Publication Types:  
Research Support, Non-U.S. Gov't

PMID: 18606966 [PubMed - in process]

**3: Neuroscientist. 2008 Jul 8. [Epub ahead of print]**

**Astrocyte Responses after Neonatal Ischemia: The Yin and the Yang.**

Villapol S, Gelot A, Renolleau S, Charriaut-Marlangue C.

Université Pierre et Marie Curie, Paris, France.

Neonatal encephalopathy is a major predictor of neurodevelopmental disability in term infants and occurs in 1 to 6 of every 1000 live term births. Despite improvements in perinatal practice during the past several decades, the incidence of cerebral palsy attributed to neonatal asphyxia remained essentially unchanged, primarily because management strategies were supportive and not targeted toward the processes of ongoing injury. Traditionally, experimental research in vivo focused on neurons, and more recently, oligodendrocytes whereas astrocytes have been more or less neglected. This review aims at dissecting possible protective as well as destructive roles of astrocytes in the immature ischemic brain to stimulate further research into this unexplored aspect of brain pathophysiology. **NEUROSCIENTIST XX (X):xx-xx, XXXX. DOI: 10.1177/1073858408316003.**

PMID: 18612085 [PubMed - as supplied by publisher]

**4: Hum Pathol. 2008 Jul 7. [Epub ahead of print]****Elevated circulating fetal nucleated red blood cells and placental pathology in term infants who develop cerebral palsy.**

Redline RW.

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An elevated circulating fetal nucleated red blood cell count has long been recognized as an indicator of significant intrauterine stress. However, the nature of the causative events and their timing remain controversial. In this study, subacute and chronic placental lesions known to be associated with neurodisability were used as surrogates for antenatal stress. Mother-infant pairs with complete blood counts within 2 hours of delivery ( $n = 81$ ) were drawn from a larger database of 152 term infants with cerebral palsy. An elevated nucleated red blood cell count ( $2.5 \times 10^3/\text{mm}^3$ ) in these infants was associated with a significantly increased prevalence of subacute or chronic placental lesions, whereas clinical findings did not significantly differ. The number of nucleated red blood cells per 10 high-power fields of villous parenchyma was directly correlated with the nucleated red blood cell count, and a threshold of 10 or more nucleated red blood cells predicted a nucleated red blood cell count greater than  $2.5 \times 10^3/\text{mm}^3$ . Among individual placental lesions, multiple foci of avascular villi and chronic villitis were significantly associated with an elevated nucleated red blood cell count, whereas meconium-associated vascular necrosis showed a borderline association. Acute chorioamnionitis was the only placental lesion more common in the group without elevated nucleated red blood cell count. The presence of significant placental lesions was associated with an elevated nucleated red blood cell count in infants with or without either acidosis (cord pH  $<7.0$ ) or birth asphyxia (American College of Obstetrics and Gynecology criteria). Acidosis and birth asphyxia were not significantly related to an elevated nucleated red blood cell count in infants without these placental lesions.

PMID: 18614199 [PubMed - as supplied by publisher]

**5: Exp Physiol. 2008 Jul 4. [Epub ahead of print]****Effect of Botulinum toxin-A-induced paralysis and exercise training on mechanosensing-signalling gene expression in juvenile rat gastrocnemius muscle.**

Velders M, Legerlotz K, Falconer SJ, Stott NS, McMahon CD, Smith HK.

Department of Sport and Exercise Science, University of Auckland.

Intramuscular injections of the paralytic Botulinum neurotoxin-A (Btx) and physical exercise are used in the treatment of chronic spasticity in children with cerebral palsy. We tested whether Btx-induced paralysis and/or exercise training would have differential effects on the expression of mechanosensing-signalling genes implicated in the adaptive remodelling of skeletal muscle. Juvenile (29 day-old) male rats were injected with Btx or saline (NoBtx) into the right gastrocnemius and housed in standard cages (NoEx) or with running wheels (Ex), for three weeks ( $n = 6$  per group). The mRNA expression of nine sarcomere-associated genes in the medial gastrocnemius was then determined by quantitative RT-PCR. Btx-injected muscles weighed 50% less than NoBtx muscles, but Ex had no effect on the wet mass of Btx or NoBtx muscles. Atrogenic MuRF1, sarcomeric Titin and myogenic MyoD were upregulated (2-fold) with the elimination of contractile activity in Btx muscle. Expression of CARP, Ankrd2 and MLP was increased with mechanical stimuli associated with Btx (5- to 10-fold) or Ex (2- to 4-fold). CARP and Ankrd2 expression increased synergistically in Btx-Ex muscle ( $\geq 20$ -fold), indicating that these genes may be sensitive to passive stretch of the sarcomeric I-band region of Titin to which their proteins bind. Tcap, Myopalladin and Atrogin1 were not, or no longer responsive to the altered mechanical stimuli after three weeks of Btx or Ex. The expression of Ankrd2, CARP, and MLP may thus be enhanced by passive stretch within the Btx-paralysed and/or exercising gastrocnemius and contribute to adaptations, other

than muscle mass, in juvenile rats.

PMID: 18603602 [PubMed - as supplied by publisher]

**6: Dev Med Child Neurol. 2008 Jul;50(7):520-3.**

**Quantifying weight bearing while in passive standers and a comparison of standers.**

Kecskemethy HH, Herman D, May R, Paul K, Bachrach SJ, Henderson RC.

Nemours Biomedical Research, Nemours/Al duPont Hospital for Children, Wilmington, DE, U.S.A.

Mechanical loading plays an important role in skeletal health, and this is a major reason standing devices are widely used with non-ambulatory persons. However, little is known about the true axial loading that occurs while in a stander, or the factors which may impact loading. The purpose of this study was to quantify weight borne while in a stander, and to directly compare different standers. Load measuring footplate adaptors were designed and fabricated specifically for this study. Weight bearing loads in 20 non-ambulatory persons with quadriplegic cerebral palsy aged 6 to 21 years (median 14y) were continuously monitored during routine 30-minute standing sessions. Fourteen participants were female, six were male; one was Gross Motor Function Classification System (GMFCS) Level IV, and 19 were GMFCS Level V. Each participant was monitored on four to six occasions over an 8-week period, two to three times in each of two different standers (total 108 standing sessions). Weight bearing loads ranged widely from 37 to 101% of body weight. The difference between standers was as much as 29% body weight. There is wide variance in the actual weight borne while in passive standers. The type of stander utilized is one factor which can significantly affect the amount of weight borne.

PMID: 18611202 [PubMed - in process]

**7: Dev Med Child Neurol. 2008 Jul;50(7):515-9.**

**Skeletal maturation in children with cerebral palsy and its relationship with motor functioning.**

van Eck M, Dallmeijer AJ, Voorman JM, Becher JG.

Department of Rehabilitation Medicine, VU University Medical Center and EMGO Institute, VU University Medical Center, Amsterdam, the Netherlands.

The objective of this study was to describe skeletal maturation in relation to chronological age in children with cerebral palsy (CP) aged 9 to 16 years, and to analyze the relationship between skeletal maturation and motor functioning. The skeletal age of 100 children with CP (37 females, 63 males; age 9, 11, or 13y; 73 ambulant, 27 non-ambulant) was determined over a period of 3 years based on X-rays of the hand (Greulich and Pyle technique). Motor functioning was measured with the Gross Motor Function Measure-66. The skeletal age of females with CP was significantly higher than their chronological age, but this did not apply to males. Longitudinal analysis showed no difference in the course of skeletal age in relation to chronological age over a 3-year period for sex or for level of ambulation. No association was found between changes in skeletal age and changes in gross motor function over the 3-year period. Skeletal age during (pre-)puberty in females with CP is advanced in relation to chronological age. No evidence was found that children with CP are at risk for deterioration in gross motor function as a result of skeletal maturation during puberty.

PMID: 18611201 [PubMed - in process]

**8: Dev Med Child Neurol. 2008 Jul;50(7):510-4.****Impact of modafinil on spasticity reduction and quality of life in children with CP.**

Murphy AM, Milo-Manson G, Best A, Campbell KA, Fehlings D.

Atlantic Health Sciences Corporation, Dalhousie University, Halifax, Nova Scotia, Canada.

This randomized double blind AB/BA cross-over trial evaluates the effect of oral modafinil versus placebo on spasticity, function, and quality of life in children with cerebral palsy (CP). Outcomes were measured at the start and end of both 8-week treatment periods (modafinil and placebo). The order of the treatment periods was randomly assigned. There was a 4-week wash-out period between treatments. Primary outcomes include the Modified Ashworth Score (MAS), and the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD), a disorder-specific quality of life measure. Ten children were randomized and eight children completed the study. The mean age of participants was 11 years 5 months (SD 1y 5mo, range 8y 8mo-12y 11mo). Five of the participants were male and three female. Seven children had a diagnosis of spastic quadriplegic CP and one child had spastic diplegia with overflow tone to the upper extremities. The Gross Motor Function Classification System ranged from Level III to V with one child at Level III, six children at Level IV, and one at Level V. The CPOCHILD pre- to post-total scores showed a slight improvement in quality of life during the placebo period and a slight deterioration in the modafinil period (overall mean change of 7.1, SD 7.6). A t-test between post differences was statistically significant ( $t=2.65$ ,  $p=0.03$ ) in favor of the placebo period. The MAS for elbow flexors, ankle flexors, and hip adductors did not show any significant reduction post-modafinil or post-placebo ( $p$  values ranged from 0.41-0.79). This study did not find evidence that modafinil reduces spasticity or has a positive impact on quality of life in children with spastic CP.

PMID: 18611200 [PubMed - in process]

**9: Dev Med Child Neurol. 2008 Jul;50(7):503-9.****Results of treatment when orthopaedic surgeons follow gait-analysis recommendations in children with CP.**

Lofterød B, Terjesen T.

Section for Child Neurology, Rikshospitalet University Hospital, and Medical Faculty, University of Oslo, Oslo, Norway.

The aim of the present study was to assess the outcome of orthopaedic surgery in ambulant children with cerebral palsy, when the orthopaedic surgeons followed the recommendations from preoperative three-dimensional gait analysis. 55 children, mean age 10y 11mo, were clinically evaluated by orthopaedic surgeons who proposed a surgical treatment plan. After gait analysis and subsequent surgery, three groups were defined. In group A, there was agreement between clinical proposals, gait-analysis recommendations, and subsequent surgery in 128 specific surgical procedures. In group B, 54 procedures were performed based on gait analysis, although these procedures had not been proposed at the clinical examination. In group C, 55 surgical procedures that had been proposed after clinical evaluation were not performed because of the gait-analysis recommendations. The children underwent follow-up gait analysis 1 to 2 years after the initial analysis. The kinematic results were satisfactory, with improvement in most of the gait parameters in children who had undergone surgery and no significant deterioration in those who were not operated. In group A, there were significant improvements in maximum hip extension in stance, minimum knee flexion in stance, timing of maximum knee flexion in swing and knee range of motion, maximum ankle dorsiflexion in stance, and mean femur rotation in stance. In group B, there were significant improvements in maximum hip extension in stance, minimum knee flexion in stance, and knee range of motion. We conclude that gait analysis was useful in confirming clinical indications for surgery, in defining indications for surgery that had not been clinically proposed, and for excluding or delaying surgery that was clinically proposed.

PMID: 18611199 [PubMed - in process]

**10: Dev Med Child Neurol. 2008 Jul;50(7):487-93.**

**Life expectancy in cerebral palsy: an update.**

Strauss D, Brooks J, Rosenbloom L, Shavelle R.

Life Expectancy Project, San Francisco, CA, USA.

This paper clarifies and updates some issues of life expectancy in cerebral palsy. These are: (1) the definition of life expectancy and how it is calculated; (2) the secular trends that have occurred since the data for the 1998 paper were collected; (3) revised estimates reflecting improvements of some of the analytical methods and statistics provided in that paper; (4) comparison of life expectancies among countries; (5) issues regarding quality of care; and (6) consideration of prospective life expectations in addition to current life expectancy.

PMID: 18611196 [PubMed - in process]

**11: Disabil Rehabil. 2008 May 19:1-9. [Epub ahead of print]**

**Influence of adapted sport on quality of life: Perceptions of athletes with cerebral palsy.**

Groff DG, Lundberg NR, Zabriskie RB.

Department of Exercise and Sport Science, University of North Carolina at Chapel Hill, North Carolina.

**Purpose.** This study sought to examine the effect of adaptive sports participation on athletic identity and influence on quality of life (QOL) for individuals with cerebral palsy (CP) participating in the CP World Games. **Method.** Surveys were conducted with 73 international athletes competing in the 2005 CP World Championships. The survey included descriptive questions about sport involvement and socio-demographics, the Athletic Identity Measurement Scale, and the Influence on Quality of Life Scale. **Results.** A significant relationship was found between influence on QOL and athletic identity ( $r = 0.505$ ;  $p < 0.001$ ). There was a moderate negative correlation between influence of adaptive sport on QOL and severity of disability ( $r = -0.264$ ,  $p < 0.05$ ). The majority of the sample either agreed or strongly agreed that adaptive sport positively influenced their overall health (84.9%) quality of life (80.8%), quality of family life (53.4%), and quality of social life (56.1%). Athletic identity ( $\beta = 0.54$ ) was the strongest predictor of influence on QOL with severity of disability ( $\beta = -0.29$ ) also a significant contributor. These athletes also had significantly higher mean AIMS scores when compared to collegiate non-athletes, collegiate recreational athletes, and recreational athletes with disabilities. **Conclusions.** The results suggest that participation in adapted sport is related to QOL and athletic identity for individuals with CP. To foster these benefits advocates for persons with disabilities should work toward increasing opportunities to compete in sports.

PMID: 18608427 [PubMed - as supplied by publisher]

**12: Disabil Rehabil. 2008 May 16:1-7. [Epub ahead of print]**

**Social adjustment at school: Are children with cerebral palsy perceived more negatively by their peers than other at-risk children?**

Nadeau L, Tessier R.

Centre for Interdisciplinary Research in Rehabilitation and Social Integration, Quebec Rehabilitation Institute, Quebec City.

**Purpose.** To compare three dimensions of social adjustment (social status, friendship and victimization) across four groups of children between the ages of nine and 12 who differ by their birth status (premature vs. at term) and the presence or absence of a motor impairment (with and without cerebral palsy [CP]). **Method.** All premature (n = 72) and term children (n = 118) without CP and all children with CP (premature with CP: n = 49; term with CP: n = 29) are part of a follow-up study. Social adjustment measures were obtained by conducting a classwide sociometric interview in the class of the target child. **Results.** Irrespective of their birth status, girls with CP have more social adjustment problems than those without a disability. With respect to victimization, the results show that, irrespective of gender, both CP children and premature children (without CP) differ from their term peers (without CP). **Conclusions.** By comparing the four groups, we are able to qualify the impact of a visible clinical impairment such as CP versus that of extreme prematurity on social adjustment.

PMID: 18608361 [PubMed - as supplied by publisher]

### **13: Disabil Rehabil. 2008 Apr 29;1-9. [Epub ahead of print]**

#### **Prerequisites for carrying out physiotherapy and physical activity - experiences from adults with cerebral palsy.**

Sandstrom K, Samuelsson K, Oberg B.

Departments of Medical and Health Sciences/Physiotherapy.

**Purpose.** The aim of this study was to get a deeper understanding into how adults with cerebral palsy (CP) experience physiotherapy and physical activity in a perspective from childhood to adulthood; and how personal and environmental factors influence possibilities for physiotherapy and physical activity. **Method.** Data was collected through interviews with 22 community-living adults (35 - 68 years) with CP, from five counties in Sweden. The questions were open-ended and the interviews were taped and transcribed to written language. The material was analysed through qualitative content analysis, a classification process resulting in different themes. **Results.** The narratives from the 22 informants, based on experiences from childhood to adulthood, resulted in a description of prerequisites for carrying out physiotherapy and physical activity. Five different themes were identified: (i) Being enjoyable, (ii) Giving effects, (iii) Being comprehensible, (iv) Being integrated in daily life, and (v) Supportive healthcare with competent professionals. **Conclusion.** The information from the interviews elucidates the importance of a life-long support from healthcare professionals. Physiotherapists with attentiveness to different life situations in combination with good understanding and knowledge in CP could facilitate continuous physical activity in people growing up and ageing with CP.

PMID: 18608404 [PubMed - as supplied by publisher]

### **14: Top Stroke Rehabil. 2008 Mar-Apr;15(2):160-72.**

#### **Cortical stimulation for upper limb recovery following ischemic stroke: a small phase II pilot study of a fully implanted stimulator.**

Huang M, Harvey RL, Stoykov ME, Ruland S, Weinand M, Lowry D, Levy R.

Department of Physical Medicine and Rehabilitation, The Feinberg School of Medicine, Northwestern University, Rehabilitation Institute of Chicago, Chicago, Illinois, USA.

**OBJECTIVE:** To evaluate the feasibility of a fully implanted cortical stimulator for improving hand and arm function in patients following ischemic stroke. **METHOD:** Twenty-four chronic stroke patients with hemiplegia were randomized to targeted implanted cortical electrical stimulation of the motor cortex with upper limb rehabilitation therapy or rehabilitation therapy alone. **RESULTS:** Using repeated measures regression models, we estimated and compared treatment effects between groups over the study follow-up period. The investigational group had significantly greater mean improvements in Upper Extremity

Fugl-Meyer (UEFM) scores during the 6-month follow-up period (weeks 1-24 following therapy), as compared to the control group (difference in estimated means = 3.8,  $p = .042$ ). Box and Block (B & B) test improvement from baseline scores were also significantly better in the investigational group across the 6-month follow-up assessments (difference in estimated means = 3.8,  $p = .046$ ). There was one report of seizure after device implant but prior to cortical stimulation and rehabilitation therapy, but no reports of neurologic decline. There were no improvements seen in the other measures assessed. **CONCLUSION:** Evidence suggests that cortical stimulation with rehabilitation therapy produces a lasting treatment effect in upper extremity motor control and is not associated with serious neurological complications. A larger multicenter study is underway.

Publication Types:  
 Clinical Trial, Phase II  
 Comparative Study  
 Multicenter Study  
 Randomized Controlled Trial  
 Research Support, Non-U.S. Gov't

PMID: 18430685 [PubMed - indexed for MEDLINE]

**15: Disabil Rehabil. 2008 Feb 19:1-12. [Epub ahead of print]**

**An investigation of the factors affecting handwriting performance in children with hemiplegic cerebral palsy.**

Bumin G, Kavak ST.

Hacettepe University School of Physical Therapy and Rehabilitation, Samanpazari Ankara, Turkey.

**Purpose.** This study investigated the effects of sensory - perceptual - motor and cognitive functions on handwriting performance in primary-school children with left-hemiplegic cerebral palsy, compared with that of their healthy peers. **Methods.** The study included 26 children aged 8 - 12 years with left-hemiplegic cerebral palsy and 32 typically developing children of similar age with dominant right hand. The Minnesota Handwriting Assessment was used to evaluate handwriting ability. The Bruininks - Oseretsky Test of Motor Proficiency was used to assess motor performance. Cognitive function was assessed by the Loewenstein Occupational Therapy Cognitive Assessment. The Ayres Southern California Sensory Integration Tests were used to assess visual perception, kinaesthesia, and graphesthesia. **Results.** Statistically significant differences were found between the two groups in sensory-perceptual-motor and cognitive function and in handwriting ability ( $p < 0.05$ ). There were also significant correlations between handwriting parameters and upper-extremity speed and dexterity, proprioception, bilateral coordination, visual and spatial perception and, visual-motor organisation in children with cerebral palsy ( $p < 0.05$ ). **Conclusions.** The results showed that left-hemiplegic children with cerebral palsy whose right sides were dominant were significantly less competent at handwriting than their right-dominant, healthy peers. It was found that the impairment in proprioception seen in the non-hemiplegic side in children with cerebral palsy, and also the impairment in bilateral coordination, speed and dexterity of the upper extremities, visual and spatial perception, visual-motor organization, and tactile-sensory impairments negatively affected their handwriting skills. In the treatment approaches for children with hemiplegic cerebral palsy, comprehensive sensory - perceptual - motor assessments that involve both extremities must be performed in detail at the earliest possible stage, in order to minimize the existing problems with early-treatment policies. Developing the sensory - perceptual - motor and cognitive function of hemiplegic children would thus be possible, and they would be able to adapt to the same primary-school curriculum as their healthy peers.

PMID: 18608406 [PubMed - as supplied by publisher]