Cerebral Palsy ALLIANCE

NEWS
Cerebral Palsy Research

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Interventions and Management

1. Phys Occup Ther Pediatr. 2014 Oct 1. [Epub ahead of print]

Hand-Arm Bimanual Intensive Therapy Including Lower Extremities (HABIT-ILE) for Children with Cerebral Palsy.

Bleyenheuft Y1, Gordon AM.

Hand-arm Bimanual Intensive Therapy and Constrained-Induced Movement Therapy have shown evidence of effectiveness in improvement of upper extremity use in children with unilateral spastic cerebral palsy (CP). The effectiveness of interventions that are based on intensive practice of activities that combine UE and LE functions has not been reported. We propose that bimanual UE activities that simultaneously require trunk and LE postural adaptations uniquely address motor control limitations of children with unilateral spastic CP. The aim of this perspective is to present such an approach Hand Arm Bimanual Intensive Therapy Including Lower Extremities (HABIT-ILE). HABIT-ILE is unique in selection of tasks and activities that require simultaneous control and coordination of UE and LE movements. It is a motor-learning-based approach using problem solving and highly structured practice. During the intervention, activities and tasks are progressively graded toward more complex bimanual coordination for the UE and increasing demands of the LE. HABIT-ILE is provided in small groups for 90 hr using a camp model. Future research (randomized controlled trial) is needed to determine the effectiveness of HABIT-ILE.

PMID: 25271469 [PubMed - as supplied by publisher]

2. Disabil Rehabil. 2014 Sep 29:1-9. [Epub ahead of print]

Upper limb function in everyday life of children with cerebral palsy: description and review of parent report measures.

Wallen M1, Stewart K.

Purpose: To determine the role, in clinical practice and measurement of outcomes of upper limb interventions, of cerebral palsy-specific self- or parent-report measures of upper limb performance in everyday activities. Method: Search of databases and handsearching for information on test development procedures, psychometric properties or relevant studies to inform study objectives. Results: Children's Hand-use Experience Questionnaire holds most promise for guiding treatment planning but requires more psychometric evidence. ABILHAND-Kids has the strongest evidence for reliability, validity and sensitivity to change; evaluates impact of intervention on bimanual

performance and can be used for children with unilateral or bilateral cerebral palsy. The original and revised versions of the Pediatric Motor Activity Log (PMAL) evaluate unilateral rather than bimanual upper limb performance. Neither ABILHAND-Kids nor PMAL offer information to assist treatment planning. PMAL-R is the only measure for the 2-5-year age group. No measure was adequate for children younger than 2 years to ascertain parents' perception of upper limb function in everyday activities. Conclusions: Understanding upper limb performance in everyday life, as perceived by children with cerebral palsy and their families, informs a comprehensive assessment and acknowledges the importance of the perspectives of child and family. Implications for Rehabilitation Cerebral palsy-specific self- or parent-report measures of upper limb performance in everyday life complement observational assessments in understanding upper limb performance CHEQ provides clinical information, ABILHAND-Kids is validated for children with unilateral and bilateral cerebral palsy and possesses the most robust psychometric properties, Revised PMAL measures unilateral upper limb use. No adequate measure for children under 2 years exists.

PMID: 25264734 [PubMed - as supplied by publisher]

3. Brain Struct Funct. 2014 Oct 2. [Epub ahead of print]

Give me a sign: decoding four complex hand gestures based on high-density ECoG.

Bleichner MG1, Freudenburg ZV, Jansma JM, Aarnoutse EJ, Vansteensel MJ, Ramsey NF.

The increasing understanding of human brain functions makes it possible to directly interact with the brain for therapeutic purposes. Implantable brain computer interfaces promise to replace or restore motor functions in patients with partial or complete paralysis. We postulate that neuronal states associated with gestures, as they are used in the finger spelling alphabet of sign languages, provide an excellent signal for implantable brain computer interfaces to restore communication. To test this, we evaluated decodability of four gestures using high-density electrocorticography in two participants. The electrode grids were located subdurally on the hand knob area of the sensorimotor cortex covering a surface of 2.5-5.2 cm2. Using a pattern-matching classification approach four types of hand gestures were classified based on their pattern of neuronal activity. In the two participants the gestures were classified with 97 and 74 % accuracy. The high frequencies (>65 Hz) allowed for the best classification results. This proof-of-principle study indicates that the four gestures are associated with a reliable and discriminable spatial representation on a confined area of the sensorimotor cortex. This robust representation on a small area makes hand gestures an interesting control feature for an implantable BCI to restore communication for severely paralyzed people.

PMID: 25273279 [PubMed - as supplied by publisher]

4. Disabil Rehabil Assist Technol. 2014 Oct 1:1-6. [Epub ahead of print]

Training to use a commercial brain-computer interface as access technology: a case study.

Taherian S1, Selitskiy D, Pau J, Davies TC, Owens RG.

Purpose: This case study describes how an individual with spastic quadriplegic cerebral palsy was trained over a period of four weeks to use a commercial electroencephalography (EEG)-based brain-computer interface (BCI). Method: The participant spent three sessions exploring the system, and seven sessions playing a game focused on EEG feedback training of left and right arm motor imagery and a customised, training game paradigm was employed. Results: The participant showed improvement in the production of two distinct EEG patterns. The participant's performance was influenced by motivation, fatigue and concentration. Six weeks post-training the participant could still control the BCI and used this to type a sentence using an augmentative and alternative communication application on a wirelessly linked device. Conclusions: The results from this case study highlight the importance of creating a dynamic, relevant and engaging training environment for BCIs. Implications for Rehabilitation Customising a training paradigm to suit the users' interests can influence adherence to assistive technology training. Mood, fatigue, physical illness and motivation influence the usability of a brain-computer interface. Commercial brain-computer interfaces, which require little set up time, may be used as access technology for individuals with severe disabilities.

PMID: 25270615 [PubMed - as supplied by publisher]

5. BMC Musculoskelet Disord. 2014 Oct 2;15(1):327. doi: 10.1186/1471-2474-15-327.

Ankle-foot orthoses in children with cerebral palsy: a cross sectional population based study of 2200 children.

Wingstrand M, Hägglund G, Rodby-Bousquet E1.

BACKGROUND: Ankle-foot orthosis (AFO) is the most frequently used type of orthosis in children with cerebral palsy (CP). AFOs are designed either to improve function or to prevent or treat muscle contractures. The purpose of the present study was to analyse the use of, the indications for, and the outcome of using AFO, relative to age and gross motor function in a total population of children with cerebral palsy. METHODS: A cross-sectional study was performed of 2200 children (58% boys, 42% girls), 0-19 years old (median age 7 years), based on data from the national Swedish follow-up programme and registry for CP. To analyse the outcome of passive ankle dorsiflexion, data was compared between 2011 and 2012. The Gross motor classification system (GMFCS) levels of included children was as follows: I (n=879), II (n=357), III (n=230), IV (n=374) and V (n=355). RESULTS: AFOs were used by 1127 (51%) of the children. In 215 children (10%), the indication was to improve function, in 251 (11%) to maintain or increase range of motion, and 661 of the children (30%) used AFOs for both purposes. The use of AFOs was highest in 5-year-olds (67%) and was more frequent at lower levels of motor function with 70% at GMFCS IV-V. Physiotherapists reported achievement of functional goals in 73% of the children using AFOs and maintenance or improvement in range of ankle dorsiflexion in 70%. CONCLUSIONS: AFOs were used by half of the children with CP in Sweden. The treatment goals were attained in almost three quarters of the children, equally at all GMFCS levels. AFOs to improve range of motion were more effective in children with a more significant decrease in dorsiflexion at baseline.

PMID: 25274143 [PubMed - in process] Free full text

6. J Phys Ther Sci. 2014 Sep;26(9):1317-9. doi: 10.1589/jpts.26.1317. Epub 2014 Sep 17.

Comparison of Spatiotemporal Gait Parameters between Children with Normal Development and Children with Diplegic Cerebral Palsy.

Kim CJ1, Son SM2.

Purpose: The purpose of this study was to determine the differences in spatiotemporal gait parameters between children with spastic diplegic CP and children with normal development (ND). Subjects and Methods: Sixteen children (eight children with spastic diplegic CP and eight ND children) were recruited for participation as volunteers in this study. The children with CP had a Gross Motor Function Classification (GMFC) System level of between I and II. [Results] Walking velocity, cadence, stride length, and step width of children with CP with a GMFC of between I and II were a level of 60%, 77%, 73%, and 160%, respectively, of those of ND children. The percentages of right and left double-limb support were 188% and 179% higher, respectively, and the proportion of single limb support was shorter by 83% and 82%. [Conclusion] Our results provide objective evidence of distinct differences in spatiotemporal gait parameters between children with spastic diplegic CP with a GMFC level I or II and ND children and would be helpful to persons involved in the care of these children.

PMID: 25276007 [PubMed] PMCID: PMC4175228 Free PMC Article

7. J Pediatr Orthop. 2014 Sep 26. [Epub ahead of print]

Relationship of Strength, Weight, Age, and Function in Ambulatory Children With Cerebral Palsy.

Davids JR1, Oeffinger DJ, Bagley AM, Sison-Williamson M, Gorton G.

BACKGROUND: The natural history of ambulatory function in individuals with cerebral palsy (CP) consists of deterioration over time. This is thought to be due, in part, to the relationship between strength and weight, which is postulated to become less favorable for ambulation with age. METHODS: The study design was prospective, case series of 255 subjects, aged 8 to 19 years, with diplegic type of CP. The data analyzed for the study were cross-sectional. Linear regression was used to predict the rate of change in lower extremity muscle strength, body weight, and strength normalized to weight (STR-N) with age. The cohort was analyzed as a whole and in groups based on

functional impairment as reflected by Gross Motor Function Classification System (GMFCS) level. RESULTS: Strength increased significantly over time for the entire cohort at a rate of 20.83 N/y (P=0.01). Weight increased significantly over time for the entire cohort at a rate of 3.5 kg/y (P<0.0001). Lower extremity STR-N decreased significantly over time for the entire cohort at a rate of 0.84 N/kg/y (P<0.0001). The rate of decline in STR-N (N/kg/y) was comparable among age groups of the children in the study group. There were no significant differences in the rate of decline of STR-N (N/kg/y) among GMFCS levels. There was a 90% chance of independent ambulation (GMFCS levels I and II) when STR-N was 21 N/kg (49% predicted relative to typically developing children). DISCUSSION: The results of this study support the longstanding clinically based observation that STR-N decreases with age in children with CP. This decrease occurs throughout the growing years, and across GMFCS levels I to III. Independent ambulation becomes less likely as STR-N decreases. This information can be used to support the rationale, and provide guidelines, for a range of interventions designed to promote ambulation in children with CP.

PMID: 25264553 [PubMed - as supplied by publisher]

8. Phys Ther. 2014 Oct 2. [Epub ahead of print]

Habitual Physical Activity of Independently Ambulant Children and Adolescents With Cerebral Palsy: Are They Doing Enough?

Mitchell LE1, Ziviani J2, Boyd RN3.

BACKGROUND: Despite the health benefits of regular physical activity, children with cerebral palsy (CP) are thought to participate in reduced levels of physical activity. OBJECTIVE: To assess physical activity and determine the proportion complying with the recommended 60 minutes of moderate to vigorous physical activity (MVPA) daily in independently ambulant children and adolescents with unilateral CP. DESIGN: Cross sectional study. METHOD: Children (n=102, 52 males, mean age 11y3mo[2y4mo]) with spastic hemiplegia classified at Gross Motor Functional Classification System (GMFCS) levels I=44 and II=58 recorded physical activity over four days using ActiGraph®GT3X+ accelerometers. Activity counts were converted into daily and hourly time spent inactive and in light or MVPA using uni-axial cut points (inactive: =100; light: 101-2295; MVPA =2296: vertical counts·min-1) and recorded step counts. Differences between groups were examined using t tests (p<0.05). RESULTS: Of a potential 396 days, 341 days were recorded (86%) with an average wear time of 11:44(1:56) hours. On a typical day, participants recorded 438(234) counts·min-1, 7541(3894) steps, spent 8:36(1:09)hrs inactive, 2:38(0:51)hrs in light activity, and 0:44(0:26)hrs in MVPA. Only 25% of participants met the recommended level of MVPA on at least one day. Physical activity was highest in boys (vs girls; p<0.001), children (vs adolescents p<0.001) and on weekdays (vs weekends; p=0.05). LIMITATIONS: Participants were limited to children classified GMFCS I-II and with unilateral spasticity. CONCLUSIONS: The majority of independently ambulant children with unilateral CP do not perform sufficient physical activity to meet public health recommendations.

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PMID: 25278338 [PubMed - as supplied by publisher]

9. Dev Med Child Neurol. 2014 Sep;56(9):912. doi: 10.1111/dmcn.12529. Epub 2014 Jul 10.

Shkedy Rabani et al. reply.

Shkedy Rabani A1, Harries N, Namoora I, Al-Jarrah MD, Karniel A, Bar-Haim S.

Comment on: Duration and patterns of habitual physical activity in adolescents and young adults with cerebral palsy. [Dev Med Child Neurol. 2014]

Measurement of habitual physical activity and sedentary behaviour of youth with cerebral palsy: work in progress. [Dev Med Child Neurol. 2014]

PMID: 25041460 [PubMed - indexed for MEDLINE]

10. Int J Pediatr Otorhinolaryngol. 2014 Sep 21. pii: S0165-5876(14)00513-8. doi: 10.1016/j.ijporl.2014.09.008. [Epub ahead of print]

Surgical management of chronic salivary aspiration.

Noonan K1, Prunty S2, Ha JF3, Vijayasekaran S3.

AIM OF THE STUDY: Sialorrhoea and chronic salivary aspiration are a major problem in many neurologically impaired children causing embarrassment, skin issues and recurrent lower respiratory tract infections (LRTI). The aim of this study was to assess the efficacy of salivary gland surgery in the treatment of chronic salivary aspiration in such children. OBJECTIVES: To compare admission rates for LRTI per annum before and after surgical intervention. METHODS: Retrospective review of all patients who underwent salivary management surgery for chronic aspiration under Princess Margaret Hospital's (PMH) Otolaryngology department from 2006 until 2013. RESULTS: Twelve patients were included in this review. Their ages ranged from 3 to 21 years (mean=11.4). Their genders were equally distributed. Two patients had underlying congenital disorders; one had an acquired brain injury, while the majority (n=9, 75%) had cerebral palsy secondary to a sustained perinatal injury. Most patients (n=11, 91.7%) had bilateral submandibular gland excision and parotid duct ligation as a primary procedure. One patient had a laryngotracheal separation. Two patients went on to have a second procedure. The mean follow up time was five years. Using Wilcoxon Signed-Rank test we showed that the median rate of admission per annum for LRTI pre-operatively was 1.0. This was reduced to 0.5 post-operatively, which was statistically significant (p=0.05). CONCLUSIONS: We hypothesize that the combination of bilateral submandibular gland excision and bilateral parotid duct ligation is effective in reducing admissions with aspiration pneumonia in neurologically impaired children, and therefore improves the quality of life in these patients.

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Prevention and Cure

11. Acta Paediatr. 2014 Oct 2. doi: 10.1111/apa.12811. [Epub ahead of print]

Very preterm birth and foetal growth restriction are associated with specific cognitive deficits in children attending mainstream school.

Kallankari H1, Kaukola T, Olsén P, Ojaniemi M, Hallman M.

AIM: This study investigated the association of prenatal and neonatal factors with cognitive outcomes in schoolchildren born very preterm without impairments at the age of nine. METHODS: We recruited a prospective regional cohort of 154 very low gestational age (VLGA) children of <32 weeks and 90 term-born comparison children born between November 1998 and November 2002 at Oulu University Hospital, Finland. Cognitive outcome was assessed using an inclusive neuropsychological test repertoire at the age of nine. RESULTS: The final study group comprised 77 VLGA children without cerebral palsy or any cognitive impairment and 27 term-born children. VLGA was associated with a 1.5-point [95% confidence interval (CI) 0.6-2.3] reduction in visuospatial-sensorimotor processing and a 1.2-point (95% CI 0.5-1.9) reduction in attention-executive functions scores. Foetal growth restriction (FGR) was the only clinical risk factor that was associated with cognitive outcome. Children with FGR had a significant decrease in language (1.7 points, 95% CI 0.50-3.0) and memory-learning (1.6 points, 95% CI 0.4-2.8) scores. CONCLUSION: Children born very preterm without impairments had poorer performance in specific neurocognitive skills than term-born children. FGR was an independent risk factor for compromised neurocognitive outcome in VLGA children and predicted difficulties in language, memory and learning.

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PMID: 25272976 [PubMed - as supplied by publisher]

12. Dev Med Child Neurol. 2014 Sep 29. doi: 10.1111/dmcn.12592. [Epub ahead of print]

Gross Motor Function Measure-66 trajectories in children recovering after severe acquired brain injury.

Kelly G1, Mobbs S, Pritkin JN, Mayston M, Mather M, Rosenbaum P, Henderson R, Forsyth R.

AIM: To explore the appropriateness of using the interval-scale version of the Gross Motor Function Measure (GMFM-66) in paediatric acquired brain injury (ABI), and to characterize GMFM-66 recovery trajectories and factors that affect them. METHOD: An observational study of gross motor recovery trajectories during rehabilitation at a single specialist paediatric in-patient rehabilitation centre using repeated GMFM-66 observations. The cohort comprised children rehabilitating after severe ABI of various causes. RESULTS: A total of 287 GMFM observations were made on 74 children (45 males, 29 females; age-at-injury range 0.3-17.3y, median age 11.3y, interquartile range 6.6-15.0y). Differences in item-difficulty estimates between this sample and the cerebral palsy population in which the GMFM-66 was initially developed are not detectable at this sample size. Changes in GMFM over time show lag-exponential forms. Children sustaining hypoxic-ischaemic injuries made the slowest and least complete recoveries. Older children made faster gross motor recoveries after controlling for aetiology. The time at which gross motor ability began to rise coincided approximately with admission to the rehabilitation facility. INTERPRETATION: Aetiology is strongly associated with gross motor recovery after ABI. Younger age at injury was associated with slower recovery. Comparable item-difficulty scores in this sample and in the cerebral palsy population suggest comparable sequences of gross motor ability reacquisition.

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PMID: 25264904 [PubMed - as supplied by publisher]

13. Eur Rev Med Pharmacol Sci. 2014 Sep;18(17):2507-17.

Qualitative motor assessment allows to predict the degree of motor disturbances.

Gajewska E1, Sobieska M, Moczko J.

OBJECTIVE: Early diagnosis is necessary in order to determine neurological integrity and the potential risk of improper development, and also to undertake possible early intervention. The quantitative assessment consists of observation of motor development, and provides information about whether a child performs an activity (movement) expected at a given life period. The qualitative assessment of motor performance verifies whether a specific activity is performed properly. The papers aims to demonstrate the motor performance assessment sheet for infants at the age of 6 months and assessment of qualitative elements of 3rd month at the age of 6 months. SUBJECTS AND METHODS: 173 infants (76f/97m) were assessed by a neurologist and a physiotherapist at the age of 6 and 9 months. The neurologist set the final diagnosis at the age of 16 months. Additionally, the physiotherapist assessed qualitative elements typical of the 6th month and of the 3rd month. Risk factors possibly affecting motor performance were considered. RESULTS: The assessment performed by the neurologist and the physiotherapist demonstrated high conformity. Infants with varying degrees of developmental delay and with cerebral palsy at the age of 6 months have still not achieved all of the qualitative characteristics typical of the 3rd month of life, nor proper performance for the 6th month. The low Apgar score and the presence of intraventricular haemorrhage affected the motor development at the age of 6 months. CONCLUSIONS: The author's motor development assessment sheet applied at the age of 6 months proves to be a sensitive research tool and demonstrates good predictive value.

PMID: 25268097 [PubMed - in process]

14. Lakartidningen. 2014 Aug 6-19;111(32-33):1296-8.

Autism spectrum disorders in severe cerebral palsy often discovered late. Retrospective review of 10 years of medical records [Article in Swedish]

Dahl M, Bergsten C, Hammarberg A, Sandström M, Strinnholm M.

PMID: 25221821 [PubMed - indexed for MEDLINE]

15. Exp Neurol. 2014 Sep 28. pii: S0014-4886(14)00296-9. doi: 10.1016/j.expneurol.2014.09.013. [Epub ahead of print]

Postnatal glucocorticoid-induced hypomyelination, gliosis, and neurologic deficits are dose-dependent, preparation-specific, and reversible.

Zia MT1, Vinukonda G2, Vose L3, Bhimavarapu BB3, Iacobas S4, Pandey NK5, Beall AM6, Dohare P2, LaGamma EF7, Iacobas DA4, Ballabh P8.
Postnatal glucocorticoids (GCs) are widely used in the prevention of chronic lung disease in premature infants. Their pharmacologic use is associated with neurodevelopmental delay and cerebral palsy. However, the effect of GC dose and preparation (dexamethasone versus betamethasone) on short and long-term neurological outcomes remains undetermined, and the mechanisms of GC-induced brain injury are unclear. We hypothesized that postnatal GC would induce hypomyelination and motor impairment in a preparation- and dose-specific manner, and that GC receptor (GR) inhibition might restore myelination and neurological function in GC-treated animals. Additionally, GC-induced hypomyelination and neurological deficit might be transient. To test our hypotheses, we treated prematurely delivered rabbit pups with high (0.5mg/kg/day) or low (0.2mg/kg/day) doses of dexamethasone or betamethasone. Myelin basic protein (MBP), oligodendrocyte proliferation and maturation, astrocytes, transcriptomic profile, and neurobehavioral functions were evaluated. We found that high-dose GC treatment, but not low-dose, reduced MBP expression and impaired motor function at postnatal day 14. High-dose dexamethasone induced astrogliosis, betamethasone did not. Mifepristone, a GR antagonist, reversed dexamethasone-induced myelination, but not astrogliosis. Both GCs inhibited oligodendrocyte proliferation and maturation. Moreover, high-dose dexamethasone altered genes associated with myelination, cell-cycle, GR, and mitogen-activated protein kinase. Importantly, GC-induced hypomyelination, gliosis, and motor-deficit, observed at day 14, completely recovered by day 21. Hence, high-dose, but not low-dose, postnatal GC causes reversible reductions in myelination and motor functions. GC treatment induces hypomyelination by GR-dependent genomic mechanisms, but astrogliosis by non-genomic mechanisms. GC-induced motor impairment and neurodevelopmental delay might be transient and recover spontaneously in premature infants.

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PMID: 25263581 [PubMed - as supplied by publisher]

16. PLoS One. 2014 Oct 3;9(10):e108904. doi: 10.1371/journal.pone.0108904. eCollection 2014.

Different patterns of punctate white matter lesions in serially scanned preterm infants.

Kersbergen KJ1, Benders MJ1, Groenendaal F1, Koopman-Esseboom C1, Nievelstein RA2, van Haastert IC1, de Vries LS1.

BACKGROUND AND PURPOSE: With the increased use of MRI in preterm infants, punctate white matter lesions (PWML) are more often recognized. The aim of this study was to describe the incidence and characteristics of these lesions as well as short-term outcome in a cohort of serially scanned preterm infants, using both conventional imaging, diffusion (DWI) and susceptibility (SWI) weighted imaging. MATERIALS AND METHODS: 112 preterm infants with 2 MRIs in the neonatal period, with evidence of punctate white matter lesions, were included. Appearance, lesion load, location, and abnormalities on DWI and SWI were scored and outcome data were collected. RESULTS: Different patterns of punctate white matter lesions did appear: a linear appearance associated with signal loss on SWI, and a cluster appearance associated with restricted diffusion on DWI on the first MRI. Cluster and mixed lesions on the first scan changed in appearance in over 50% on the second scan, whereas linear lesions generally kept their appearance. Lesions were only visible on the early scan in 33%, and were only seen at term equivalent age in 20%. Nine infants developed cerebral palsy, due to additional overt white matter lesions in six. CONCLUSION: Two patterns of punctate white matter lesions were identified: one with loss of signal on SWI in a linear appearance, and the other with DWI lesions with restricted diffusion in a cluster appearance. These different patterns are suggestive of a difference in underlying pathophysiology. To reliably classify PWML in the preterm infant in either pattern, an early MRI with DWI and SWI sequences is required.

PMID: 25279755 [PubMed - in process] Free full text