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Interventions and Management

1. Arch Phys Med Rehabil. 2011 Sep;92(9):1468-76.

Determinants of intensity of participation in leisure and recreational activities by youth with cerebral palsy.

Palisano RJ, Orlin M, Chiarello LA, Oeffinger D, Polansky M, Maggs J, Gorton G, Bagley A, Tylkowski C, Vogel L, Abel M, Stevenson R.

Department of Physical Therapy and Rehabilitation Sciences, Drexel University, Philadelphia, PA; Shriners Hospitals for Children, Philadelphia, PA.

OBJECTIVE: To test a model of determinants of intensity of participation in leisure and recreational activities by youth with cerebral palsy (CP). **DESIGN:** Prospective cohort study. **SETTING:** Children's hospitals (N=7). **PARTICIPANTS:** Youth with CP (N=205; age, 13-21y) and their parents. The sample included 107 (57.2%) males and 26 (12.7%) to 57 (27.8%) youth in each of the 5 levels of the Gross Motor Function Classification System (GMFCS). **INTERVENTIONS:** Not applicable. **MAIN OUTCOME MEASURES:** Youth completed the Children's Assessment of Participation and Enjoyment by means of an interview. Parents completed the Pediatric Outcomes Data Collection Instrument, Family Environment Scale, Coping Inventory, Measure of Processes of Care, a demographic questionnaire, and a services questionnaire. **RESULTS:** Structural equation modeling was used to test the model. Fit statistics indicate good model fit. The model explains 35% of the variance in intensity of participation. Path coefficients ($P \leq .05$) indicate that higher physical ability, higher enjoyment, younger age, female sex, and higher family activity orientation are associated with higher intensity of participation. GMFCS level and caregiver education have indirect effects on intensity of participation. The path between services and intensity of participation was not significant. **CONCLUSIONS:** Participation by youth with CP is influenced by multiple factors. The influence of physical activity supports the importance of activity accommodations and assistive technology for youth who are not capable of improving physical ability. Knowledge of family activity orientation is important for identifying opportunities for participation. The unexplained variance suggests that the model should include other determinants, such as physical accessibility and availability of transportation and community leisure and recreational activities.

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PMID: 21878219 [PubMed - in process]

2. Child Care Health Dev. 2011 Sep 1. doi: 10.1111/j.1365-2214.2011.01308.x. [Epub ahead of print]**Strategies for improving disability awareness and social inclusion of children and young people with cerebral palsy.****Lindsay S, McPherson AC.**

Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital, and Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada.

Background: Children and youth with disabilities are at a higher risk of being socially excluded or bullied while at school compared with their typically developing peers. This study explored disabled children's suggestions for improving social inclusion. Methods: Fifteen children with cerebral palsy were interviewed or took part in a group discussion about social inclusion and bullying. All interviews and focus groups were audio-recorded and transcribed verbatim. Results: The children and youth described several strategies to help improve social inclusion at school including: (1) disclosure of condition and creating awareness of disability; (2) awareness of bullying; (3) developing a peer support network and building self-confidence; and (4) suggestions on what teachers can do. Conclusions: It is recommended that children's suggestions be considered within the classroom context to enhance the social inclusion and participation of children with disabilities.

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PMID: 21880056 [PubMed - as supplied by publisher]

3. Disabil Rehabil. 2011 Aug 26. [Epub ahead of print]**Experiences of social exclusion and bullying at school among children and youth with cerebral palsy.**

Lindsay S, McPherson AC.

Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital, Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada.

Purpose: Although bullying amongst typically developing school-aged children has been well explored, it is under-researched for children with disabilities. The purpose of this study was to understand the experiences of exclusion and bullying among children with disabilities. Method: We draw on qualitative in-depth interviews and a focus group with children and youth with disabilities (n = 15) to explore their experiences of exclusion and bullying. Results: Our results showed that restrictions in the socio-contextual environment influenced the social exclusion that children experienced. Youth encountered social exclusion from both teachers and peers. Children reported that teachers' attitudes toward children with disabilities often influenced the social exclusion experienced by peers. Bullies engaged in both implicit and explicit forms of social exclusion toward children with disabilities which often lead to verbal and physical bullying. Conclusions: Children with cerebral palsy are victims of bullying and social exclusion within the school context. More opportunities for social inclusion are needed.

PMID: 21870932 [PubMed - as supplied by publisher]

4. Clin Orthop Relat Res. 2011 Sep 1. [Epub ahead of print]**Higher Expression of Myosin Heavy Chain IIX in Wrist Flexors in Cerebral Palsy.**

Gantelius S, Hedström Y, Pontén E.

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BACKGROUND: Children with cerebral palsy (CP) use their paretic arm less than normal but have a relative overactivity of wrist flexors, causing an impairing flexed position of the wrist. Voluntary use of a muscle downregulates myosin heavy chain (MyHC) IIX, but it is unclear whether the relative overactivity of wrist flexors and extensors in children with CP affects MyHC expression compared to normal subjects. QUESTIONS/PURPOSES:

We therefore asked whether MyHC expression composition differs in wrist flexors compared to extensors in children with CP and in controls and whether it is related to clinical findings. **METHODS:** We took muscle biopsies from wrist flexors and extensors during hand surgery in children with CP ($n = 9$) and during open reduction of forearm fractures in control children ($n = 5$). The expression of the MyHC I, IIa, and IIx isoforms were determined on silver-stained 6% SDS-PAGE. **RESULTS:** CP flexors showed a higher proportion of MyHC IIx (40%) than control flexors (16%) and CP extensors (20%). MyHC IIa isoform proportion was lower in CP flexors (27%) than in control flexors (46%) and in CP extensors (45%). MyHC I expression was lower in CP (36%) than in controls (46%) for wrist extensors only. **CONCLUSIONS:** Both the brain injury in CP and the different demands on flexors and extensors affect the expression of MyHCs. The higher amount of MyHC IIx in CP could be caused by a decreased voluntary use of the hemiplegic arm. **CLINICAL RELEVANCE:** More information on the structural difference between flexors and extensors in normal and spastic muscle could improve the understanding of strain of wrist extensors and possibly the development of flexion contractures in CP.

PMID: 21882064 [PubMed - as supplied by publisher]

5. Dev Med Child Neurol. 2011 Aug 30. doi: 10.1111/j.1469-8749.2011.04093.x. [Epub ahead of print]

Wearable wrist activity monitor as an indicator of functional hand use in children with cerebral palsy.

Bialocerkowski AE.

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PMID: 21883172 [PubMed - as supplied by publisher]

6. Dev Med Child Neurol. 2011 Aug 30. doi: 10.1111/j.1469-8749.2011.04078.x. [Epub ahead of print]

Wearable wrist activity monitor as an indicator of functional hand use in children with cerebral palsy.

Howcroft J, Fehlings D, Zabjek K, Fay L, Liang J, Biddiss E.

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Aim: New tools that capture hand function in everyday activities and contexts are needed for assessing children with hemiplegic cerebral palsy. This study evaluates a wearable wrist monitor and tests the hypothesis that wrist extension frequency (FreqE) is an appropriate indicator of functional hand use. **Method:** Fifteen children (four females, 11 males; age range 6-12y; mean age 10y [SD 2y]) with hemiplegia (seven at level I and eight at level II on the Manual Ability Classification System) participated in the Assisting Hand Assessment (AHA) while wearing the wrist monitor. FreqEs were captured via the wrist monitor and validated using video analysis. Correlations between FreqE and AHA scores were calculated and a multivariate linear regression was conducted to explore other measures of wrist activity. **Results:** Wrist extensions observed in video analyses were reliably detected by the wrist monitor (intraclass correlation coefficient, $r=0.88$; $p<0.001$) and were strongly correlated with the AHA scores ($r=0.93$; $p<0.001$). AHA scores were significantly correlated with FreqE ($r=0.80$; $p=0.001$) and the range of wrist extensions/flexions ($r=0.70$; $p=0.008$). The multivariate linear regression combining the FreqE and range of wrist extensions/flexions yielded a strong correlation with AHA scores ($r=0.84$; $p=0.0043$). **Interpretation:** The wearable wrist monitor may offer a convenient, valid alternative to observer reports for functional assessments of the hemiplegic hand in everyday contexts.

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PMID: 21883170 [PubMed - as supplied by publisher]

7. Gait Posture. 2011 Aug 27. [Epub ahead of print]**Rectus femoris transfer and musculo-skeletal modeling: Effect of surgical treatment on gait and on rectus femoris kinematics.**

Desailly E, Khouri N, Sardain P, Yepremian D, Lacouture P.

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Spasticity of the rectus femoris (RF) is one of the possible causes of stiff knee gait (SKG) in cerebral palsy. Musculoskeletal studies have shown that in SKG, length and speed of the RF are affected. No evaluation had been made to quantify the modifications of those parameters after surgery. The effect of this operation on gait quality and on RF kinematics was assessed in this study in order to identify kinematic patterns that may aid its diagnosis. For 26 transfers, clinical gait analysis pre- and post-surgery was used to compute the Gait Deviation Index (GDI) and Goldberg's index. The kinematics of the Original RF path (ORFp) was studied before and after surgery. The expression ORFp was chosen to avoid any confusion between this modeling parameter, whose computation was unchanged, and the actual anatomical path that was modified by surgery. The gait quality was improved ($+18 \pm 12$ GDI) and there was an inverse relation between the pre-operative GDI and its improvement. The Goldberg's index was improved (88% of the cases). The operation had a significant effect on the normalization of the timings of maximum length and speed of the ORFp. The improvement of SKG was correlated with the normalization of the timing of the ORFp's maximum length. The global improvement of the gait quality and of the SKG was demonstrated. Some parameters of muscular kinematics (RF length and velocity) have been standardized, showing an effect of the transfer not only during the swing, but also during stance. The premature timing of the ORFp peak length has been identified as a prognostic factor of a successful surgical outcome.

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PMID: 21873065 [PubMed - as supplied by publisher]

8. NeuroRehabilitation. 2011 Jan 1;29(1):37-43.**Electrical stimulation improves gait in children with spastic diplegic cerebral palsy.**

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Background: Electrical stimulation (ES) of proximal muscles during gait training has not previously been reported as a management option for improving muscle tone and gait in spastic diplegic children. **Objective:** To investigate the effects of simultaneous continuous ES of both hip abductors and adductors during walking on muscle tone, knee alignment and gait characteristics in children with spastic diplegic cerebral palsy (CP). **Subject:** Three groups of children participated in this project: the study group, consisting of 17 ambulant children with spastic diplegic CP; a control group of 15 ambulant children with spastic diplegic CP; and another control group, with 17 healthy children. **Methods:** The study group underwent two different ES management programs. The first was a one-time trial management program that involved ongoing ES of bilateral hip adductor and abductor muscles at the sensory and motor levels, respectively, during walking for a predetermined distance. The second ES program lasted for one week and involved 15 minutes of ongoing ES of bilateral hip adductor and abductor muscles at the sensory and motor levels, respectively, during walking for three sessions a day for the week. **Results:** Marked improvement in gait performance ($p < 0.001$), muscle tone ($p < 0.01$) and knee position of the study group was observed. **Conclusion:** ES to the hip adductor and abductor muscles simultaneously at the sensor and motor levels, respectively, improved gait in spastic diplegic CP children.

PMID: 21876294 [PubMed - in process]

9. Dev Med Child Neurol. 2011 Aug;53(8):680-1. doi: 10.1111/j.1469-8749.2011.04030.x. Epub 2011 Jun 17.

Effects of a home-based treadmill training exercise program on impairment and function.

Low S.

Comment on

Dev Med Child Neurol. 2011 Aug;53(8):742-50.

PMID: 21679366 [PubMed - indexed for MEDLINE]

10. Dev Med Child Neurol. 2011 Aug;53(8):677. doi: 10.1111/j.1469-8749.2011.04020.x. Epub 2011 Jun 17.

Functional decline in children undergoing selective dorsal rhizotomy after age 10.

Baker R, Graham K.

Comment on

Dev Med Child Neurol. 2011 Aug;53(8):717-23.

PMID: 21679363 [PubMed - indexed for MEDLINE]

11. NeuroRehabilitation. 2011 Jan 1;29(1):23-7.

The effect of robo-horseback riding therapy on spinal alignment and associated muscle size in MRI for a child with neuromuscular scoliosis: An experimenter-blind study.

Lee DR, Lee NG, Cha HJ, O YS, You SJ, Oh JH, Bang HS.

Sports and Fitness Center for Children with Disabilities, Yonsei University, Wonju, Republic of Korea Department of Physical Therapy Program, Yonsei University, Wonju, Republic of Korea.

Purpose: This case study was conducted to highlight the clinical and radiological features of a patient with progressive neuromuscular scoliosis before and after robo-horseback riding therapy (HBRT). **Design:** A clinical, laboratory, and radiological analysis of a single case. **Subject:** An 11-year-old child, diagnosed right thoracolumbar neuromuscular scoliosis secondary to cerebral palsy. **Method:** The child received a 5-week course of robo-HBRT, comprising of 60-minute periods a day, five times a week. Postural alignment was determined by Cobb's method. A real-time magnetic resonance imaging (MRI) was performed to determine the robo-HBRT-induced changes in cross-sectional area (CSA) of bilateral thoracic (T2) and lumbar (L2) paraspinalis. Clinical tests including the standard Gross Motor Function Measure (GMFM) and manual muscle testing (MMT) with the Lafayette Manual Muscle Tester were used to compare the intervention-related changes in motor performance and power. The surface EMG was also used to examine therapy-induced changes in muscle activity amplitude for bilateral T2 and L2 paraspinalis and rectus abdominis muscles. **Results:** Clinical motor and strength scores increased after the intervention. Radiographic Cobb's angle, MRI, and electromyographic amplitude data demonstrated notably enhanced spinal alignment and muscle fiber CSA and symmetry, respectively. **Conclusions:** This is the first study to provide evidence of the therapeutic efficacy of a novel form of robo-HBRT on motor function and associated structural and motor control improvements, thus suggesting a method of augmenting therapy in neuromuscular scoliosis.

PMID: 21876292 [PubMed - in process]

12. Pediatr Radiol. 2011 Aug 30. [Epub ahead of print]**Fracture after bisphosphonate treatment in children with cerebral palsy: the role of stress risers.**

Harcke HT, Stevenson KL, Kecskemethy HH, Bachrach SJ, Grissom LE.

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BACKGROUND: In the nonambulatory cerebral palsy (CP) population with a prior history of fracture, the use of pamidronate is not always effective in preventing further fractures. **OBJECTIVE:** To test the hypothesis that when fractures occur after cyclic pamidronate, they will be at the proximal or distal end of a pamidronate band. **MATERIALS AND METHODS:** Retrospective review of our CP patient database revealed 53 children who had received one or more complete courses of pamidronate therapy (five cycles over 12 months). Medical records were screened to identify children who had sustained a fracture or fractures after completing treatment. **RESULTS:** Of 53 patients treated with pamidronate, only 14 sustained fractures after treatment. Radiographs were available for 11 patients, showing 19 fractures. Sixty-three percent of these fractures were located at a junction with pamidronate bands but not within the bands. **CONCLUSIONS:** We propose stress risers as the mechanism for fractures that have occurred where bone mineral density abruptly changes as a result of cyclic administration of pamidronate. We show a theoretical example of how alternative dosing might reduce the ratio and therefore decrease the chance of formation of a stress riser.

PMID: 21877116 [PubMed - as supplied by publisher]

13. Disabil Rehabil Assist Technol. 2011 Aug 30. [Epub ahead of print]**An overview of systematic reviews of adaptive seating interventions for children with cerebral palsy: where do we go from here?**

Ryan SE.

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Purpose: This article provides an overview and assessment of systematic reviews of adaptive seating outcomes in children with cerebral palsy (CP) and proposes strategies to advance and improve the clinical utility of future research evidence. **Methods:** A comprehensive search for systematic reviews was performed to locate and evaluate the functional effects of adaptive seating in children with CP. Relevant electronic databases were searched to identify reviews published between January 1990 and December 2010. **Results:** The search yielded five reviews of adaptive seating interventions that found generally positive, but inconclusive evidence of effectiveness for postural control and management, seated posture, upper extremity function, and overall clinical outcomes. Review authors consistently reported that they were unable to combine data from original research studies to make sound clinical recommendations due to the low quality of studies, the lack of appropriate outcome indicators, and the heterogeneity and lack of clarity in population characteristics and adaptive seating interventions. **Conclusions:** Strategies to improve the quality and clinical relevance of new research evidence for adaptive seating interventions include the adoption of an expanded view of child functioning, a child motor function classification and development approach, and contemporary frameworks for the measurement and evaluation of assistive technology outcomes.

PMID: 21877900 [PubMed - as supplied by publisher]

14. NeuroRehabilitation. 2011;28(3):183-97.**Computer and cell phone access for individuals with mobility impairments: an overview and case studies. Burgstahler S, Comden D, Lee SM, Arnold A, Brown K.**

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Computers, telephones, and assistive technology hold promise for increasing the independence, productivity, and participation of individuals with disabilities in academic, employment, recreation, and other activities. However, to reach this goal, technology must be accessible to, available to, and usable by everyone. The authors of this article share computer and telephone access challenges faced by individuals with neurological and other impairments, assistive technology solutions, issues that impact product adoption and use, needs for new technologies, and recommendations for practitioners and researchers. They highlight the stories of three individuals with neurological/mobility impairments, the technology they have found useful to them, and their recommendations for future product development.

PMID: 21558625 [PubMed - indexed for MEDLINE]

15. NeuroRehabilitation. 2011 Jan 1;29(1):29-36.**The effect of combining daily restraint with bimanual intensive therapy in children with hemiparetic cerebral palsy: A self-control study.**

Cohen-Holzer M, Katz-Leurer M, Reinstein R, Rotem H, Meyer S.

Alyn Hospital, Pediatric and Adolescent Rehabilitation Center, Jerusalem, Israel.

Aim: To examine the influence of combining restraint therapy with bimanual intensive therapy on the unimanual and bimanual function among children with hemiparetic cerebral palsy (CP). Included were nine children (ages 6-9 yr), with Manual Ability Classification System scores of 2-3, Gross Motor Functional Classification System 1-2; **Intervention:** 10 days, six hours per day including one hour of restraint followed by five hours of bimanual activities. **Evaluations:** One month and immediately prior to the intervention (as the control period), immediately, two months and six months post-intervention. The Assisting Hand Assessment was the primary outcome measure, along with the Jebsen-Taylor Test of Hand Function, the Jamar pinch gauge for grip and pinch, and the Pediatric Evaluation of Disability Inventory (PEDI). **Results:** No significant change was observed during the pre-intervention control period in any of the outcome measures; a significant improvement in all outcome parameters was noted after the intervention as compared to the control period. These achievements were still significantly higher than baseline values at six months post-intervention. **Conclusion:** Children with hemiparetic CP at this level of impairment might benefit from a short daily intervention program of combining restraint with bimanual training in order to improve unimanual and bimanual function.

PMID: 21876293 [PubMed - in process]

16. Invest Ophthalmol Vis Sci. 2011 Aug 27. [Epub ahead of print]**Repair Of Strabismus And Binocular Fusion In Children With Cerebral Palsy: Gross Motor Function Classification Scale.**

Ghasia F, Brunstrom-Hernandez J, Tychsens L.

Departments of Ophthalmology and Visual Sciences.

Purpose: Children with cerebral palsy (CP) tend either to be excluded from studies of strabismus repair, or pooled with children who have other neurological disorders. We limited this study to children with defined CP in order to determine success or failure of restoring eye alignment and fusion. **Methods:** An observational, cross-sectional design prospective study was conducted on a representative cohort of 50 children. CP severity ranged from Gross Motor Function Classification Scale (GMFCS) Level 1 (least severe) to 5 (most severe). Mean age at entrance and surgery was 3.5 years and mean follow-up 4.1 years (minimum 1 yr). **Results:** The predominant form of strabismus

was infantile-onset: esotropia in 54%, exotropia in 26%, and dyskinetic in 10%. 66% of esotropic children and 61% of exotropic children achieved optimal (microtropic) alignment after an average of 2 and 1.8 surgical procedures, respectively. The likelihood of optimal alignment was similar in children with mild (GMFCS Level 1-2) vs. severe (GMFCS Level 3-5) CP (chi square $p = 0.7$). Irrespective of GMFCS severity, 46% of children gained binocular fusion/stereopsis, but the quality of fusion gained was greater in children with mild CP ($p < .05$). Earlier surgery was more likely to achieve success ($p < .05$). Conclusions: Restoration of binocular alignment and a degree of fusion is a realistic goal in the majority of strabismic CP children. Repair may be achieved in children at both mild and severe ends of the GMFCS spectrum, without undue concern of treatment futility or excessive re-operation.

PMID: 21873677 [PubMed - as supplied by publisher]

17. Lung India. 2011 Jul;28(3):209-11.

Pulmonary sequestration cyst in a patient of cerebral palsy.

Mirza B, Saleem M, Ijaz L, Qureshi A, Sheikh A.

Department of Pediatric Surgery, The Children's Hospital and The Institute of Child Health, Lahore, Pakistan.

Pulmonary sequestration cyst is a rare entity in pediatric patients. Most of the time, it is diagnosed as an incidental finding. It is associated with other congenital anomalies, especially congenital diaphragmatic hernia. We report a patient of cerebral palsy presented with vomiting and recurrent chest infections. He was diagnosed to have hiatal hernia on computed tomography scan of chest. At operation, a pulmonary sequestration cyst along with hiatal hernia, malrotation, and meckel's diverticulum was encountered. The sequestration cyst was managed through transhiatal approach.

PMID: 21886959 [PubMed - in process]

18. Dev Med Child Neurol. 2011 Aug;53(8):681-2. doi: 10.1111/j.1469-8749.2011.04034.x. Epub 2011 Jun 27.

How do we use the assessment of general movements in clinical practice?

Spittle A.

Comment on

Dev Med Child Neurol. 2011 Aug;53(8):751-6.

PMID: 21707606 [PubMed - indexed for MEDLINE]

18. Physiother Can. 2010 Fall;62(4):338-46. Epub 2010 Oct 18.

Ethics of involving children in health-related research: applying a decision-making framework to a clinical trial.

Kelly B, Mackay-Lyons MJ.

Barbara Kelly, BScPT, MSc (Rehab Research): Physiotherapist, IWK Health Centre, Halifax, Nova Scotia; Instructor, School of Physiotherapy, Dalhousie University, Halifax, Nova Scotia.

Purpose: This paper explores ethical issues related to the involvement of children in health-related research through the application of a conceptual model (the Miller and Kenny framework) to a current clinical trial on casting protocols for equinus gait of children with cerebral palsy (CP). Summary of key points: The direct involvement of children in health-related research is important for maintaining and improving standards of paediatric clinical care. Ethical considerations around investigations involving this highly vulnerable population are complex, however, requiring the involvement of many levels of decision makers-government, research ethics boards (REBs), health care providers, parents, and children. The Miller and Kenny framework is useful in distinguishing these levels and

heightening awareness of the complexities of the issues around engaging children in research. Considerations include the role of parents/caregivers in decision making, individual assessment of the child's decisional capacities, close attention to the child's context and life experience, provision of developmentally appropriate information about the research study, and careful assessment of dissent prior to withdrawing the child from the study. Recommendations: Physical therapists involved in paediatric clinical practice and/or research must be knowledgeable about ethical principles, policies, and REB requirements. The Miller and Kenny framework is a helpful guide to clarify decision-making roles around children's participation in research.

PMID: 21886373 [PubMed - in process]

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