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Search Sources: Medline, CINAHL

Topic: For children with developmental disabilities, is adaptive seating more effective than standard seating in improving function?

ASD= adaptive seating device, CP= Cerebral Palsy, PND= progressive neuromuscular disorder, DMD= Duchenne muscular dystrophy, FA= Friedreich's ataxia

| Author/Year/Journal/ Title | Purpose/Outcome of Interest | Design/ Subjects | Intervention | Measurements/Timeline | Results | Conclusions/ Application to PICO | Comments/ Limitations |
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| Clark J, et al. 2004 *International journal of therapy and rehabilitation*<br><br>Wheelchair postural support for young people with progressive neuromuscular disorders... including commentary by Springle S, Liu M. | Determine effects of postural support within a wheelchair on posture, respiratory function, and upper limb function for children with PND.<br><br>Posture, respiratory function, upper limb function | Prospective quasi-experimental design<br><br>19 males ages 6-21 with PND (15 with DMD and 4 with FA) | Two PT visits:<br><br>1- PT evaluation and family education on wheelchair<br><br>2- Individually adapted wheelchair administered. Outcome measures administered in standard wheelchair and individually adaped wheelchair. | Respiratory function measured with compact spirometer.<br><br>Posture measured with CODA Motion Analysis System.<br><br>Upper limb function. Measured with Jebsen test.<br><br>All measures taken twice at second visit, once in standard chair, once in individually adapted chair. | Immediate improvement in posture in individually adapted wheelchair. Postural improvements observed: trunk more extended, shoulders more level, abdominal and sternal body segments aligned, and shoulder girdle and pelvis aligned.<br><br>No immediate improvement in respiratory or upper limb function with use of individually adapted wheelchair. | There can be immediate improvement in posture with the use of individually adapted seating compared to using standard seating. Immediate improvements are not seen in respiratory function and upper limb function with the use of individually adaptive seating. | Jebsen test is an inappropriate outcome measure for measuring upper limb function in this population, as it only measures speed of task.<br><br>Results could have been contaminated by fatigue from taking measurements twice in one day or from drastically changing the child's position from one they were accustomed to being functional in. |
| Chung J, et al. 2008 *Pediatric Physical Therapy*<br><br>Effectiveness of adaptive seating of sitting posture and postural control in children with cerebral palsy | To review published literature on:<br>1) The effect of adaptive seating on postural control/sitting posture in children with CP<br>2) If changes in postural control lead to changes in function.<br><br>Postural control, sitting posture, function | Systematic review<br><br>Non-ambulatory children with CP, ages 0 – 20. | Various forms of adaptive seating in each study.<br><br>Studies were excluded if there were multiple interventions along with adaptive seating. | - The American Academy for Cerebral Palsy and Development Medicine Quality Assessment Scale to assess group designs.<br>- The Quality, Rigor, or Evaluative Criteria for single subject research designs.<br>-The Sacket et al. and Harris et al. methods for scoring evidence level. | Methodological quality: weak (3 articles), moderate (7), strong (4)<br>Levels of Evidence: II- 3 articles, III- 2, IV- 6, V- 3<br>Optimal seat inclination: anterior (10-20°), neutral, posterior (5° ) tilt shown effective in improving postural control in different studies.<br>Seat inserts, 3-point trunk supports, and modular seating systems improve postural control. Mixed results on saddle seats effects on postural control.<br>Function: Mixed results on upper limb funcion. Studies show improved mobility, social interaction and ADLs with adaptive seating. | No one adaptive seating intervention is better than another for improvement in posture/postural control.<br><br>Studies with a low level of evidence show improved postural control improves function, therefore further research with higher levels of evidence needs to be done on how posture effects function. | Majority of studies had low methodological quality and level of evidence.<br><br>Different outcome measures used across all studies.<br><br>Search limited to English language. |

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| Rigby, et al. 2009 *Arch Phys Med Rehabil*<br><br>Effect of adaptive seating devices on the activity performance of children with cerebral palsy | To evalute the short-term effects on activity performance and satisfaction with 2 adaptive seating devices for children with CP.<br><br>Activity performance on 3-5 family identified tasks child is having difficulty with and satisfaction with these tasks. | Prospective quasi-experimental A1-B-A2 design<br><br>30 children ages 2.6 to 6.7 years with CP. GMFM level III or IV. One parent/ caregiver participated for each child. | For 6 weeks child uses 1 and/or 2 seating systems (Flip2Sit activity seat or Aquanut toileting system). Family is to encourage child to engage in the the 3-5 identified activities. | Canadian Occupational Performance Measure (COPM) taken at baseline (A1), end of intervention phase (B), and postintervention phase (A2).<br><br>Home activity log (HAL) taken at end of A1, alternating weeks in phase B and A2 by phone or in-person interview. | At baseline, 30 parents reported difficulty with self-care, 27 with play, 6 with social/quiet recreation.<br><br>COPM activity performance scores increased by average of 4.6 and satisfaction increased by average of 4.9 points.<br><br>When ASD was removed, there was a decline in activity performance.<br><br>HAL results: Themes- ASD can have enabling influence on child, it is found useful, and that it did not meet every families need. | Parents perceived improved activity performance and had increased satisfaction with their child's use of an adaptive seating device. However, not all families felt that the adaptive seating met their child's needs. | The therapists administering the outcome measures knew the goals of the study, therefore there could have been bias in the reported results. |
| Reid D, et al. 1999 *Pediatric Rehab.*<br><br>Functional impact of rigid pelvic stabilizer on children with cerebral palsy who use wheelchairs: users' perceptions | To assess functional impact of rigid anterior pelvic stabilization device (RPS) compared to a traditional wheelchair lap on children with CP.<br><br>Activity performance and satisfaction. | Prospective quasi-experimental A1-B-A2 design<br><br>6 children with CP and their caregivers. Ages 8.3 to 12.75, 4F and 2M. | 5 weeks with RPS mounted on child's wheelchair. Caregiver responsible for child using RPS. RPS has 3 parts: a support pad, release mechanism, and seat bracket. | COPM used on 5 key activities identified by children/family taken at baseline (A1), end of intervention phase (B), and postintervention phase (A2). | 73% of subjects identified difficulties in self-care and 27% in productivity at baseline.<br><br>Mean performance and satisfaction scores increased from 2 to 5.8 points for all subjects. | The RPS device for adaptive seating improves functional performance, perceived functional performance, and satisfaction in children with CP. | Small sample size.<br><br>All outcome measures were subjective as they were based on the child/parent's self-report. |

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| Rigby P, et al. 2001<br>*Assistive Technology*<br><br>Effects of a wheelchair-mounted rigid pelvic stabilizer on caregiver assistance for children with cerebral palsy. | To assess caregiver assistance on task performance with use of a rigid anterior pelvic stabilization device (RPS) compared to a traditional wheelchair lap on children with CP.<br><br>Caregiver assistance. | Prospective quasi-experimental A1-B-A2 design<br><br>6 children with CP and their caregivers. Ages 8 to 12, 4F and 2M. 5 children used power wheelchair, 1 child used a manual wheelchair. | 5 weeks with RPS mounted on child's wheelchair. Caregiver responsible for child using RPS. RPS has 3 parts: a support pad, release mechanism, and seat bracket. | COPM used on 5 key activities identified by children/family taken at baseline (A1), end of intervention phase (B), and postintervention phase (A2).<br><br>The Caregiver Assistance Scale (CGA) from the Pediatric Evaluation of Disability Inventory (PEDI) given weekly.<br><br>Daily log completed by caregiver. | COPM scores are listed in the article above (Reid D, et al. 1999)<br><br>With RPS use:<br>- Caregiver assistance was reduced in 57% of the tasks for all children. - Caregiver assistance decreased by $\geq$ 2 for 30% of tasks on CGA.<br>- Caregiver assistance did not increase with any tasks.<br>- All children were repositioned less frequently.<br>- Parents reported improved sitting ability, endurance, and reaching. | The RPS has shown to reduce caregiver assistance for functional tasks when compared to a traditional lap belt for children with CP; therefore it may promote a greater degree of independence with completing functional tasks. | This study has the same subjects as the study above, however it was evaluating different outcomes- caregiver assistance.<br><br>Applying this intervention to other patient populations could make this research more generalizable. |
| Vekerdy Z.<br>2007<br>*Disabil Rehabil.*<br><br>Management of seating posture of children with cerebral palsy by using thoracic-lumbar-sacral orthosis with non-rigid SIDO frame | To examine the effects of the thoracic-lumbar-sacral orthosis with non-rigid SIDO frame (TLSO-SIDO) in non-ambulant children with CP.<br><br>Spine curvature, functional activities, posture, parental satisfaction, feeding. | Prospective quasi-experimental design<br><br>47 children with CP ages 1.7 to 11.2, 20M and 22F. GMFM level III- 7 children, IV- 15 children, V- 20 children. | All participants were fitted for an individually molded TLSO-SIDO frame at baseline visit. All subjects participated in intervention for different amounts of time (4 to 18 months), as the follow-up appointments were scheduled. | 1) Past Medical History<br>2) X-rays of thoracic and lumbar spine<br>3) GMFM<br>4) 8-item mail questionnaire developed by researchers on function, posture, satisfaction, and duration of use<br>5) 15 item checklist created to assess feeding difficulties.<br><br>All measures taken at baseline, except #4 was mail questionniare at 3 months.<br><br>Only measure taken at follow-up appointment was X-ray of thoracic and lumbar spine. | 88.9% of children had significant change in the spine's position.<br><br>Mean time wearing TLSO-SIDO was 3.9 +/- 2.4 hours.<br><br>Parents reported less problems with feeding (91.4%), improved hand-eye coordination (54.3%), playing (48.6%), and posture (trunk- 88.6%, head- 82.9%).<br><br>Majority of parents were satisfied with TLSO-SIDO.<br><br>14 out of 15 children improved in feeding. | The use of the TLSO-SIDO in children with CP can improve posture while using the device. An improvement in posture may increase function and improve feeding per parents' reports while child is using TLSO-SIDO. | No control group.<br><br>Lack of standardized outcome measures used for assessing outcomes (function, posture, and feeding).<br><br>No instructions were provided for how families were to use the TLSO-SIDO.<br><br>Only 35 parents returned mail questionnaires (83.33%). |

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| Hulme et al. 1987<br>*Physical Therapy*<br><br>Behavioral and postural changes observed with use of adaptive seating by clients with multiple handicaps. | The purpose of this study was to evaluate the effectiveness of Adaptive Seating Devices (ASDs).<br><br>Sitting posture, head control, visual tracking, reach, and grasp. | Prospective longitudinal quasi-experimental design<br><br>19 children with varying disabilities, ages 16 months to 3.9 years, 13M and 6F. All subjects non-ambulatory and non-verbal. | For 9 months individualized ASD was used.<br><br>Optional training programs for sitting balance, head control, visual tracking, reach, and grasp were available to group 2.<br><br>Group 1: ASD intervention<br>Group 2: ASD intervention and optional training programs<br>Group 3: includes data on groups 1 and 2 | Assessment instrument created by researchers. It is an observational assessment with 7-items evaluating the following behaviors: sitting, head control, visual tracking, reach, and grasp. Administered every 3 months in Group 1 and every 6 weeks in Group 2.<br><br>Parent-guardian questionnaire administered twice, once at beginning and end of study. | Group 3 (includes data on groups 1 and 2): Sitting posture and head control improved significantly. Radial and digital grasp improved.<br>Reach and visual tracking had no significant change. | For children developmental disabilities there can be improvements in sitting posture, head control, and grasp while seated in an ASD, but no improvements have been shown for visual tracking or reaching. | Only group 2 was given the option of participating in training programs, this could contaminate results. However, majority did not participate.<br><br>The study was carried out on group 1 the year prior to group 2. Researchers decided to create group 2 because they realized taking measurements every 6 weeks would help develop more comprehensive conclusions than every 3 months as in group 1. |
| Hopkins B and Ronnqvist L. 2002<br>*Developmental Psychobio.*<br><br>Facilitating postural control: effects on the reaching behavior of 6-month old infants | To evaluate changes in postural control and reaching for 6-month old infants in a modified chair compared to an unmodified/standard chair.<br><br>Reaching and posture. | Prospective quasi-experimental design<br><br>10 infants, ages 5 months 16 days to 6 months 16 days, 4M and 6F.<br>All infants not able to sit independently and performed some reaching. | No intervention.<br><br>Infants posture and reach was evaluated in an unmodified and a modified seat during one visit. The unmodified seat was the Mothercare multirecliner and the modified seat was designed to have support for the back, hips, upper legs and to encourage back extension. | Camera/video recording and reflective markers on infant to assess reaching and posture. Graphs, algorithms, and equations were used to obtain data on reaching and posture.<br><br>Measurements taken at first/only visit. | In the modified chair infants had greater head stability and their reaches were straighter (fewer MUs).<br><br>Infants who started reaching at a later age had straigher reaches (fewer MUs) in the modified chair.<br><br>The duration and distance of the reach was not much different in either chair.<br><br>There was more unilateral reaching regardless of seating. | There is improved head stability and reaching ability for a 6 month old infant when using a modified chair, as seen by decreased arm and head MUs. The modified chair is more beneficial for an infant with less reaching experience. | Small sample size.<br><br>No standardized outcome measures were used.<br><br>Long-term effects were not evaluated. |
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| Myhr and von Wendt<br>1991<br>*Developmental Medicine and Child Neurology*<br><br>Improvement of functional sitting position for children with cerebral palsy | To find a functional sitting position for children with CP.<br><br>Head control, trunk control, foot control, arm function, hand function. | Quasi-experimental single group pre-posttest design<br><br>23 children ages 2.6 to 16.2 years with CP, 8F and 15M | Children tested for 5 min in each sitting position below at one visit:<br>1- Child's usual adapted chair<br>2- #1 + cut-out level table in front of child<br>3- #6 – abduction orthosis and table<br>4- #1 + abduction orthosis<br>5- #6 – table<br>6- Functional sitting position (FSP) (children < 7 in 'Maxit' chair (n=11), children > 7 in 'Real' chair (n=12)). See description of FSP in article below. | Children video-recorded and photographed in all six positions.<br><br>Sitting Assessment Scale (SAS)<br><br>Measures taken for each position once at first visit. | Sitting position 6 (Maxit or Real chair) improved head control (none to fair), trunk control (none to poor), foot control (poor to fair), arm function (poor to fair), and hand function (none/poor to fair).<br><br>SAS median score increased from 8 to 14. | Children with CP sat better (with less pathological movements, better posture and arm/hand function) in the FSP than their original position. Therefore a FSP with the seat tipped forward, a firm backrest supporting the pelvis, table to support arms, and footrests that allow feet to move backwards may promote improved posture and function. | Low level of evidence (IV).<br><br>Small sample size.<br><br>No follow-up testing. |
| Myhr et al.<br>1995<br>*Developmental Medicine and Child Neurology*<br><br>Five-year follow-up of functional sitting position in children with cerebral palsy | To re-evaluate children with CP who began using the FSP five years ago (see study above)<br><br>Head control, trunk control, foot control, arm function, hand function. | Quasi-experimental single group pre-posttest design<br><br>10 children with spastic diplegia ages 7.3 to 10.9 years old, 2F and 8M | Functional sitting position:<br>Seat sloped forward, firm backrest supporting pelvis, hip-belt attached at 45°, abduction orthosis, foot-rests allowing backward foot movement, cut-out level table in front.<br><br>Observed for 5 min in FSP. | Same procedure as above for photography and video recording.<br><br>Sitting Assessment Scale<br><br>Measures taken once during visit while children in FSP. | Improvements in head control, trunk control, and foot control, and hand function. SAS score increased significantly. | There were continued improvements in posture and function for children with CP who used the FSP for 5 years. | Small sample size.<br><br>No control group.<br><br>No information about other interventions children participated in over 5 year period. |

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| Smith-Zuzovsky and Exner 2004 *The American Journal of Occupational Therapy*<br><br>The effect of seated positioning quality on typical 6- and 7-year-old children's object maninupation skills | To compare object manipulation skills while children sit in an optimal position in individually fitted classroom furniture versus standard classroom furniture.<br><br>Object manipulation skills | Prospective quasi-experimental design<br><br>40 children ages 6 to 7 years, 20F and 20M. | 2 groups of 20 children:<br><br>Both groups were tested with the VMI to ensure they were typically developing (above 16$^{th}$ percentile) in the individually fitted furniture.<br><br>Then each groups was tested with the IMT, one group was tested in the individually fitted furniture, one group in the standard classroom furniture.<br><br>Optimal position: feet flat on floor, knees at 90°, back on backrest, desk height at ~ bent elbows. | Developmental Test of Visual Motor Integration (VMI)<br><br>In-hand Manipulation Test (IMT)<br><br>Measures taken at one time period. | Children in individually fitted furntiure scored significantly higher on the IMT than children in the standard furniture, specifically on more difficult items. | Optimal positioning by using individually fitted classroom furniture allows children to have better object manipulation skills than when seated in standard classroom furniture. If children are being tested on object manipulation skills the child's position is important to consider. | This study was performed on typically developing children, so is not generalizable to children who are not typically developing. Also only evaluated object manipulation skills, so cannot assume there would be improvement with other tasks.<br><br>Examiners were not blinded. |