The effect of positioning for children with cerebral palsy on upper-extremity function: a review of the evidence

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CRD summary
The author concludes that an upright sitting position improves upper-extremity functioning in a child with cerebral palsy. Children should be fitted for wheelchairs that place them in a functional sitting position (FSP) using the complete FSP package. Given the inadequate reporting of the review process and the poor quality of the available evidence, the author's conclusions should be treated with caution.

Authors' objectives
To determine the most appropriate seating position for children with cerebral palsy (CP) to promote energy conservation and optimal functional abilities.

Searching
MEDLINE, PubMed, CINAHL, AMED, HealthSTAR, EMBASE, the Cochrane Database of Systematic Reviews, DARE, ACP Journal Club, the Cochrane CENTRAL Register, OTseeker and PEDro were searched for published articles from 1980. The search dates were not reported, but search terms were. A bibliographic review was carried out to identify further articles.

Study selection
Studies of positioning of children with CP were eligible for inclusion, whereas those that included surgical interventions were excluded. The included studies examined neutral pelvis position, anterior tilted pelvis achieved through functional seating position (FSP), seat angle, body orientation and external devices, and were of children with spastic CP (diplegia, tetraplegia and/or quadriplegia). Some studies also included children with athetoid CP, dystonic syndrome, dystonic tetraplegia, and multiple handicaps such as mental retardation and hyptotonicity. The severity of the participants' CP varied between the included studies. Studies evaluating upper-extremity function were eligible for inclusion, and the primary outcomes of interest were reaching and grasping. The included studies used the Sitting Assessment Scale, direct observation, questionnaire, cognitive tests, time to complete task, number of movements to complete a task and the accuracy of a task to measure upper-extremity functioning. Studies of experimental trials or qualitative measures were eligible for inclusion. Single case studies were excluded. The included study designs were randomised controlled trials (RCTs), case-control studies, before-and-after studies, cross-sectional studies, quasi-experimental studies, experimental crossover design, single case design and longitudinal studies.

The author did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The author did not state that they assessed validity.

Data extraction
The author did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
The results were presented in a narrative synthesis. Further information was evident from the tables. The results were discussed separately according to the type of intervention.

Results of the review
Sixteen articles (n=174) were included: 2 randomised crossover trials (n=22), 5 prospective case-control studies (n=39), 3 before-and-after studies (n=41), 2 cross-sectional studies (n=36), 1 quasi-experimental study (n=10), 1 experimental crossover design (n=6), 1 single case design (n=10) and 1 longitudinal study (n=10).
Three of the 4 studies evaluating neutral pelvis positioning showed a positive benefit on upper-extremity functioning (p<0.05 and p<0.01 where provided). One RCT found no significant difference between neutral positioning supported in a standing frame and posterior pelvic unsupported sitting.

Both studies of anterior pelvic tilt using FSP demonstrated a significant benefit of FSP on upper-extremity functioning (p<0.001). The full FSP package of orientation of 0° to 15°, hip belt, abduction orthosis (AO), footrests and cutout tray significantly improved functioning compared with FSP without AO or cutout tray (p<0.001).

Four of the 5 studies evaluating seat position did not show any significant benefit of a forward seat position.

Of the 3 studies of body orientation, two measuring a neutral or slightly forward seating position found that this had a significant benefit on reaching and grasping efficiency. One study evaluating the effect of a neutral or forward body orientation on reaching speed was less methodologically rigorous.

There were 2 studies of external devices. The results for the benefits of adding an AO were mixed. One prospective case-control study found a significant benefit with the addition of an AO to a neutral or forward body orientation. The other prospective case-control study found no significant difference in functioning between a group with FSP alone and a group with FSP and AO.

**Authors' conclusions**
Evidence indicates that an upright sitting position improves upper-extremity functioning in a child with CP. Children with CP should be fitted for wheelchairs that place them in a FSP, including an orientation in space of 0° to 15°, a hip belt, an AO, footrests, a cutout tray and a forward sloping seat of 0° to 15°.

**CRD commentary**
The review addressed a clearly defined question and several relevant databases were searched. However, unpublished data were excluded and it was unclear whether any language restrictions were applied to the search; publication and language bias cannot, therefore, be ruled out. There was insufficient information about the study selection and data extraction processes to rule out the possibility of error and bias. A validity assessment does not appear to have been carried out, thus it is not possible to determine the quality of the included studies. The majority of the studies were uncontrolled and many had small sample sizes, thereby limiting the ability to draw reliable and valid conclusions. Given the high level of clinical heterogeneity, the decision to combine the results in a narrative synthesis was appropriate. However, for some studies the appropriate statistical information was not provided, which makes it difficult to judge the strength of the evidence. For other studies the reviewers interpreted the findings as clinically significant in the absence of statistical significance. Some results may therefore have been overstated. Given the inadequate reporting of the review process and the poor quality of the available evidence, the author's conclusions should be treated with caution.

**Implications of the review for practice and research**
Practice: The author stated that children with CP should be fitted for wheelchairs that place them in an FSP, including an orientation in space of 0° to 15°, a hip belt, an AO, footrests, a tray and a forward sloping seat of 0° to 15°. The exact seating position should be determined on an individual basis by the therapist. Therapists should ensure that the line of gravity of the child’s trunk, shoulders and head are anterior to their ischial tuberosities.

Research: The author stated that further rigorous research such as RCTs should be carried out, with participants stratified according to severity of CP.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.