

## A systematic review of evidence around dynamic seating for children with dystonia

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### Summary

Dynamic seating has been proposed as a solution for seating children with dystonia for several decades, however there is very little evidence to support or undermine its use. This paper presents a systematic review of the evidence, concluding with proposals for the direction of future research and product development.

### Aims & Objectives

A systematic review was been conducted on research literature relating to dynamic seating and dystonia to enable the direction of future research to be determined, and to ensure that work is not duplicated. This paper will

1. Outline the principles of dynamic seating
2. Present a systematic review of the evidence around dynamic seating for children with dystonia
3. Make recommendations for further research

### Background

Children with dystonia experience frequent and powerful involuntary whole body extensor movements, causing discomfort and immobility; contrasted with periods of hypotonia also resulting in loss of function(1). These symptoms severely limit the child's ability to function, with a commensurate reduction in quality of life(2). Dynamic seating has been proposed as a partial solution to seating children with dystonia. It is seating that is able to move with the child, and accommodate involuntary hypertonic movements, while providing sufficient support during hypotonic phases.

### *Proposed method (search strategy)*

Future research should be guided by existing evidence of what is or is not effective, and knowledge of what still remains to be learned. We used a systematic Boolean research strategy in EMBASE and MEDLINE to search scientific literature for studies discussing or evaluating dynamic seating for people with dystonia. The search strategy is given below.

### NOTES:

- The search runs in sequence from top to bottom.
- Search terms in inverted commas are indexing search terms recognised by EMBASE.
- '\*' is a wildcard that can represent any character or characters. This enables stemmed search queries that can capture multiple words. E.g. a search for dyskine\* would capture dyskineTIC and dyskineSIA.
- Search queries can be combined using Boolean operators. For example, query #7 (#5 OR #6) aggregates the results of queries #5 and #6 using the OR operator; and query #8 (#4 AND #7) outputs results that are common to queries #4 and #7 using the AND operator.
- The suffixes 'ab' and 'ti' after a search term indicate that the abstracts and titles of papers should be searched.

Query No.; Query; Number of Results

#1; dystoni\*:ab,ti OR 'dystonic disorder'; 18,539

#2; 'cerebral palsy'; 31,054

#3; 'dyskinesia' OR dyskine\*:ab,ti OR atheto\*:ab,ti OR 'athetosis'; 33,268

#4; #1 OR #2 OR #3; 78,271

#5; seat\*:ab,ti OR 'seat' OR chair\*:ab,ti OR 'chair'; 59,606  
#6; 'standing frame' OR stander\*:ab,ti; 334  
#7; #5 OR #6; 59,932  
#8; #4 AND #7; 493  
#9; dynamic\*:ab,ti OR 'dynamic' OR complian\*:ab,ti OR 'compliance (physical)'; 605,149  
#10; #8 AND #9; 25

The output from this search was screened by hand for relevance. This resulted in 3 papers being considered from the initial search. It was planned that the papers would be further screened and classified on the following criteria: functional level (participant GMFCS(3)), intervention type, study type, outcomes used, duration, economic impact and bias.

#### *Results* (initial summary analysis)

The search yielded 3 papers (4–6) describing evaluations of dynamic seating for people with dyskinesia. Two of the papers (4,5) describe the same study.

Study: Cimolin(4,5), Hahn(6)

Sample size: 10 (GMFCS V), 12 (mixed GMFCS, 2 dystonic)

Randomisation: N, Y

Control: Internal, External

Intervention: R82 X-Panda, Quantum Rock Active

Degrees of Freedom: 1, 2

Study Type: Internally controlled trial, Randomised controlled trial (unblinded)

Functional outcome measures: N, Y (PEDI, GMFM-66)

Objective quantitative measures: Y (motion analysis), Y (range of motion)

Economic assessment: N, N

Bias: ?, ? (measurement and analysis not blinded)

Neither paper shows strong results for or against the use of dynamic seating with children with dystonia.

#### **Discussion**

With so few papers being returned by the search, a systematic review in its usual sense was not possible; however what is clear is that it is difficult to draw any firm conclusions from research conducted so far. There is a clear need for further research to determine the functional benefit or otherwise of dynamic seating, and to determine which features and configurations may or may not support the ability of a seat to improve the functioning and participation of a child with dystonia.

The papers also demonstrate the lack of functional outcomes available for use with this severely disabled population. Further work to develop suitable functional measures would support the ability of researchers to conduct meaningful research to inform the development of better seating.

The two seat designs presented in these 3 papers are diverse, the R82 x-panda is a backrest movement only seat (4,5) and the Rock Active affords movement of the hips and knees(6); however there is little consensus in this or other literature on what constitutes effective design, or why use of a design may or not result in any change in the user's function. This is to be expected as there is currently no evidence to support the success or otherwise of one design over another.

A broadly focused scoping review is planned to examine a range of literature and media around In the light of the paucity of evidence in dynamic seating for children with dystonia, with the purpose

of establishing clinical approaches to seating for dystonia and the technological state-of-the-art. This review and the existing systematic review will form the basis for subsequent recommendations made for research and product development in seating for children with dystonia.

## References

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