Exercise interventions that improve gross motor function in ambulant school-aged children with cerebral palsy: a systematic review.

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OBJECTIVES
To evaluate the effectiveness of active exercise interventions proposing to improve gross motor activity and/or participation of ambulant/semi-ambulant school-aged children with CP.

BACKGROUND
Gross motor function is the most significant limiting factor to participation in physical activity and other everyday tasks for children with CP.

Active exercise interventions are known to improve ICF Body Structure and Function outcomes such as strength and fitness. Impact on reducing Activity limitations or Participation restrictions has not been examined by a systematic review.

METHODS
- Systematic review - PRISMA and AACPDM methodology
- 5 databases searched for (Cerebral Palsy) AND (gross motor) AND terms for intervention, exercise or therapy.

Inclusion criteria: (i) active, land-based, gross motor exercise interventions, (ii) for children aged 5-18 years with ambulant or semi-ambulant cerebral palsy (GMFCS-I & II), and (iii) evaluated at least one gross motor outcome.

Exclusion criteria: (i) intervention not defined; (ii) not exercise (e.g. medication, surgery or equipment); (iii) not land-based (e.g. hydrotherapy); or (iv) a specialized therapy involving large equipment or animals (e.g. treadmill/ equine).

Two reviewers examined and rated each article for evidence level and conduct rating.

RESULTS

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Strong supporting evidence for improving GM function</th>
<th>Moderate supporting evidence for improving GM function</th>
<th>Weak supporting evidence for improving GM function</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMAT (Gross Motor Activity Training)</td>
<td>6 II-IV</td>
<td>2 II</td>
<td></td>
</tr>
<tr>
<td>GMAT+PT+PRE</td>
<td>3 II</td>
<td>4 II-V</td>
<td></td>
</tr>
<tr>
<td>GMAT+PT</td>
<td>1 II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Fitness Training</td>
<td>4 II-V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Sport</td>
<td>3 IV-V</td>
<td></td>
<td></td>
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<tr>
<td>Non-Immersive Virtual Reality</td>
<td>12 II-V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT+PRE (without additional PT)</td>
<td>4 II</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evidence Level
I = Strong evidence for use for improving GM function
II = Moderate supporting evidence for improving GM function
II-V = Weak supporting evidence for improving GM function

Studies frequently failed to:
- achieve high levels of study conduct (only 12/34 studies classified as strong level evidence)
- report or regulate the dose, intensity, and content of control interventions, particularly standard care
- investigate large variations in doses of all target interventions
- examine clinical utility of intervention dose (several studies examined doses upwards of 50 hours)
- report power calculations and study attrition
- use outcome measures that had capacity to measure true functional gains by including measures of participation and personal goal setting

Conclusions

- Literature supports active exercise interventions that:
  i. engage children in performance-focused functional activities
  ii. in real-world participation contexts and
  iii. include opportunities for variable practice
- Further studies are necessary:
  i. to clarify dose, intensity and content of all interventions
  ii. by involving homogeneous samples of ambulant children rather than combined ambulant/non-ambulant groups
  iii. by using higher level, ability appropriate gross motor assessments without ceiling effects for ambulant children
  iv. to evaluate true functional gains by including measures of participation and personal goal setting

DISCUSSION
Effective active exercise interventions were more likely to:
1. improve specific functional tasks when the intervention was performance-focused
2. improve participation activities such as community mobility, sport or self-care when performed in real-world participation contexts
3. include a large range of varied gross motor activities in their prime intervention (GMAT, GMAT+, MS, NVR and PFT) or additional physiotherapy as part of intervention protocols (GMAT+ and GMAT-PRE+)
4. encourage individual variation in activity technique

Questions? Contact Georgina Clutterbuck at georgina.clutterbuck@uqconnect.edu.au

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