MOTOR SKILLS INTERVENTION RESEARCH OF CHILDREN WITH DISABILITIES

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BACKGROUND

• Childhood sedentary behavior and obesity are recognized as public health issues (USDHHS, 2011; PAGAC, 2008)

• Children with cognitive and physical impairments participate in significant less (~1/4) physical activity than comparison peers (Rimmer, 2008)

• Childhood obesity tends to track into adulthood (Mamun et al., 2009)

• Obesity-related healthcare expenditures exceed $210 billion/year (Calwey, 2012)
BACKGROUND

• Children’s motor skill proficiency positively related to
  – Physical activity throughout the lifespan (Williams et al., 2008)
  – Increased body composition and waist circumference (Okey, Booth, & Shey, 2008)

• Motor skill intervention studies are important to
  – Document successful intervention methods
  – Test behavioral modification theories among children with disabilities
  – Positively effect health & quality of life outcomes
BACKGROUND

• Systematic literature reviews are conducted to understand narrowly focused research questions

• Scoping reviews conducted
  – When research area does not have uniformity in study design and measurement (Hempel et al., 2008)
  – To understand a ‘broader research landscape’ (Petticrew, 2006)
  – Determine the feasibility of conducting a systematic review (Arksay, 2005)
METHOD

• Inclusion criteria:
  – English-language - Ages 3-18
  – Motor skill interventions
  – Outcome measure was product oriented
  – Peer-reviewed primary literature and review articles
  – Disability defined as someone with a physical or cognitive impairment

• Exclusion criteria:
  – Mental health - Descriptive studies
  – Not disability related - Discussion article
  – Not motor skill related - Program descriptions
  – Medically oriented treatment studies - Outcome process oriented
  – Non-peer-reviewed publications
METHOD

• Search Strategy
  – Literature search conducted from January to July 2015
  – MEDLINE, PsycInfo, and CINAHL databases
  – 1984 to 2014
  – Keywords included physical activity interventions, motor skill interventions, motor ability interventions, gross motor skills, fundamental movement skills, AND interventions studies AND disability, OR developmental disabilities, OR autism, OR cerebral palsy, OR intellectual disability, OR mental retardation
METHOD

- Modified Downs & Black (1998) validated quality assessment tool used to assess article’s quality and risk of bias
- 27-item checklist
- Uses a yes/no response format
- 5 areas of study quality
  - Reporting (10) (1 = ≥ 8)
  - External validity (3) (1 = ≥ 2)
  - Internal validity risk of bias (7) (1 = ≥ 5)
  - Internal validity confounding (6) (1 = ≥ 4)
  - Statistical power (1) (1 = ≥ 1)
- High Quality = 5, Moderate = 3-4, Low = 1-2
- Articles independently reviewed and coded by each author.
DATA EXTRACTION AND SYNTHESIS

• 11-item data extraction table created for data extraction and evaluation.
  – Year of publication, authors, study design, participants, disability diagnostic tool, motor skill intervention approach, intervention length, intervention setting, motor skill outcome measure, data analysis, results, and study quality indicator

• Research design categories: RCT, NRCT, NRCTwR, pre-post trial with retention (no control group), post-test only, case study, SSD

• Intervention type: motor skills training program, constraints focused intervention, physical activity/educational games, instructional prompting, instructional climate, parent assist, visualization, peer tutoring, movement concepts/theses, sports team

• Motor skills outcomes: object control skills, locomotor, both
## RESULTS

### Table 1. Classification of Articles

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CHARACTERISTICS OF DISABILITIES

- Total participants: N= 918 (range = 1, 233, $M = 41.7$, $SD = 52.1$)
  - 596 males ($M = 27.1$, $SD = 39.39$), 322 females ($M = 14.6$, $SD = 16.0$)
- Developmental delay ($n = 9$, 40.9)
- Autism ($n = 4$, 18.2%)
- Cross-disability ($n = 4$, 18.2%)
- Intellectual disability ($n = 1$, 4.5%)
- Cerebral palsy ($n = 1$, 4.5%)
- Conduct disorder ($n = 1$, 4.5%)
- Developmental coordination disorder ($n = 1$, 4.5%)
- Learning disabilities ($n = 1$, 4.5%)
CHARACTERISTICS OF RESEARCH DESIGNS

• RCT (N = 1, 4.5%)
• Non-randomized controlled trial (N= 10, 45.5%)
• Single-subject design (N = 5, 22.7%)
• Case studies (N = 2, 9.1%)
• Non-randomized controlled trial with retention (N = 2, 9.1%)
• Pre-post trial with retention (N = 1, 4.5%)
• Randomized, post-test only (N = 1, 4.5%)
CHARACTERISTICS OF DIAGNOSTIC METHOD

• Clearly stated in 14 (63.4%) of studies
• Eligible to receive special education services (N=5, 22.7%)
• TGMD (N=3, 13.6%)
• Physician diagnosis (N=3, 13.6%)
• Basic Motor Ability Test-Revised (N=1, 4.5%)
• Achenbach’s Youth Self-Report (N=1, 4.5%)
• Multiple diagnostic tools (N=1, 1.4%)
CHARACTERISTICS OF INTERVENTION TYPE

- Motor skills training programs (N = 7, 31.8%)
- Instructional climate (n = 4, 18.2%)
- Peer tutoring (n = 3, 14.6%)
- Physical activity/educational games (n = 2, 9.1%)
- Constraints focused (n = 1, 4.5%)
- Instructional prompting (n = 1, 4.5%)
- Parent assist (n = 1, 4.5%)
- Visualization (n = 1, 4.5%)
- Movement concepts/movement themes (n = 1, 4.5%)
- Sports team (n = 1, 4.5%)
CHARACTERISTICS OF MOTOR SKILLS

- Object control (n = 22, 100%)
- Object control only (n = 9, 40.1%)
- Locomotor only (n = 1, 0.0%)
# RESULTS

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<th>Disability</th>
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<td>Autism (n=4)</td>
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<td>Totals (n=22)</td>
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### RESULTS

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<tr>
<th></th>
<th># of Sessions</th>
<th>Sessions/week</th>
<th>Session length</th>
<th>Weeks of intervention</th>
<th>Overall minutes</th>
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<td><strong>Total</strong></td>
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<td>44.66</td>
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<td><strong>Mean (SD)</strong></td>
<td>31.09 (29.57)</td>
<td>2.23 (.94)</td>
<td>46.5 (20.4)</td>
<td>15.48 (16.13)</td>
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<sup>a</sup>Minutes
SUMMARY OF RESULTS

- 22 studies met the inclusion criteria
- 2 studies met criteria for “high quality”
- 10 studies met criteria for “medium quality”
- 10 studies were “low quality”
- 8 separate disability categories
- 5 categories of disability diagnosis
- 7 types of research designs
- 10 intervention categories
- 2 motor skill outcomes
- 1 study used random sampling and RCT
DISCUSSION

• Only 22 motor skills intervention studies over 30 years
  – Schools are increasingly difficult to access for research participation
  – Difficult to acquire appropriate sample size for conducting RCT, especially for low-incidence disability groups
  – “Withholding treatment” required for RCTs might be problematic with IRBs
  – RCTs are usually very expensive

• Large number of low quality studies limits conclusions concerning efficacy and generalizability of interventions
DISCUSSION

• Only 3 studies included a retention test
• Many study locations were conducted in school settings which is increasingly difficult to acquire researcher access
LIMITATIONS

• Search terms may not have captured each study on each specific disability group
• Successful non-peer reviewed studies (e.g., dissertations) not reviewed
• Most interventions did not implement previously validated intervention approaches
RECOMMENDATIONS/SO WHAT?

• Replication needed
  – Specific disabilities (e.g., autism, Down syndrome)
    • Studies should be designed with as much homogenous sample as possible
  – Disability categories (cognitive, physical, sensory)
    • Successful intervention strategies with one disability should be replicated with other disability in same disability category or cross-category disabilities

• Community-based interventions
• Interventions need to be based on strong behavioral theory (e.g., self-determination theory, self-efficacy)
• Translational Science
• Implementation Science
• Though gold-standard, RCTs not ideal due to low N’s
RECOMMENDATIONS/SO WHAT?

• Least studied group should receive highest priority (e.g., cerebral palsy, muscular dystrophy)
• Future study designs should include input from the stakeholder, parents, teachers, and community agencies
• More robust designs and longitudinal RCTs are needed to strengthen the results
  – Intention-to-treat analysis, effect size
  – Variations in dose (intensity, frequency, duration, and type)
• Secondary effects (e.g., body composition, social interaction, community participation)
• Use similar & validated instruments (e.g., TGMD-3, Everyone Can!)