The influence of the MATE exergaming intervention on the throwing competence of disadvantaged Grade 2 children.

Lauren Hannant, Neo Hseng Zyung & Nao Koizumi

MATE: Movement Acquisition Through Exergaming
Hot Topic

Can movement-based technologies (exergaming) improve motor competence of children?
Motor Competence: Fundamental Motor Skills

- **Locomotor** – move body in space from one point to another:
  - Run
  - Hop
  - Skip
  - Gallop
  - Slide
  - Leap
  - Jump

- **Object Control** – manipulation of an object:
  - Throw
  - Kick/punt
  - Catch
  - Roll
  - Bounce
  - Strike
  - Foot dribble

**Perceived Motor Competence:** An individual's perspective of their ability to perform motor skills. (Stodden & Goodway, 2009)
FMS are the “base camp” to the mountain of motor development. Each child needs to develop MC to travel up the mountain to skillfulness.

Clark & Metcalfe (2003)
Synergistic Developmental Trajectory Model of Motor Competence and PA

Stodden et al. (2008)
Negative Spiral of Disengagement

- Low MC > opt out of PA > have lower PA
- Less PA influences > less opportunity to practice > lower MC
- Over time low MC & PA promotes low Perceived Motor Competence (PMC)
- Interaction between PMC & MC results in lower PA levels & lower fitness levels
- Inactive & disengaged children with greater likelihood of overweight & obesity
Exergaming

- An emergent technology in physical education
- Studies have noted that technology increases sedentary time
  - These studies have used older technologies that rely on hand help controllers
- Advances in technology now mean that exergames can detect the movement of the entire body in the execution of movement skills.
  - Xbox Kinect

(Gao, Zhang & Stodden, 2013; Sun, 201; Sheehan & Katz, 2013)
The purpose of this study is to examine the effect of the MATE (movement acquisition through exergaming) program on the development of throwing competence and perceived motor competence in 7-8-year-old children who are disadvantaged.
Research Questions

- What is the influence of a 10-week MATE exergaming program on the throwing competence of seven-year-old disadvantaged students?
  - Children in the MATE condition will have greater TGMD2 throwing scores, higher throwing component scores and faster throwing velocity than children in the typical PE throwing program.
  - Children in the MATE condition will have greater perceived motor competence according to the Barnett scale and the PSPCSA.
  - Children in the MATE condition will have higher engagement (practice trails) compared to children in the typical throwing program.

- To what extent do children in the MATE program retain intervention effects 3 weeks following the completion of the program?
  - Children in the MATE program will have retained greater TGMD2 throwing scores, higher throwing component scores and faster throwing velocity than children in the typical PE throwing program.
  - Children in the MATE condition will have retained greater perceived motor competence according to the Barnett scale and the PSPCSA.
Dynamic Systems Theory

Task

Motor Competence (Throwing)

Individual  Environment
Methods – Context

- Metropolitan suburb - Australia
- 99% single parent families
- Low income & disadvantaged community
  - Weekly household income $400 - $700 AUD
- High rates of crime
- 1 park - unsafe with gangs and drug deals in the park, lots of broken glass
- All rental accommodation, with no gardens
- Sidewalks have glass & debris
- No recreation facilities within 5 kilometers
Participants and Sampling

Evaluated 500 2nd graders using the TGMD 2

100 motor delayed 2nd graders identified

MATE group
n = 50
(25 girls, 25 boys)

Comparison group
n = 50
(25 girls, 25 boys)

Further calculations:
• Mean age
• Socioeconomic status
• Ethnicity

Random assignment
Ethics

- School permission
- Parental permission
- Child assent
<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throwing competence</td>
<td>MATE Intervention</td>
</tr>
<tr>
<td>- TGMD2 Scale</td>
<td>- Comparison group</td>
</tr>
<tr>
<td>- Throwing Component</td>
<td></td>
</tr>
<tr>
<td>- Throw velocity</td>
<td></td>
</tr>
<tr>
<td>Perceived motor competence</td>
<td></td>
</tr>
<tr>
<td>- PSPCSA – physical competency</td>
<td></td>
</tr>
<tr>
<td>- Barnett scale – throw item</td>
<td></td>
</tr>
<tr>
<td>Engagement</td>
<td></td>
</tr>
<tr>
<td>- Average number of trials</td>
<td></td>
</tr>
<tr>
<td>- throughout intervention</td>
<td></td>
</tr>
</tbody>
</table>
**Dependent Variables**

- Motor Competence – measured at three time points
  - (Pretest, Posttest, Retention Test)
- TGMD2 Scale
  - Throwing item only
  - 0 – 8 points

<table>
<thead>
<tr>
<th>5. Overhand Throw</th>
<th>Skill Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attach a piece of tape on the floor 20 feet from a wall. Have the child stand behind the 20-foot line facing the wall. Tell the child to throw the ball hard at the wall. Repeat a second trial.</td>
<td></td>
</tr>
<tr>
<td>1. Windup is initiated with downward movement of hand/arm</td>
<td></td>
</tr>
<tr>
<td>2. Rotates hip and shoulders to a point where the nonthrowing side faces the wall</td>
<td></td>
</tr>
<tr>
<td>3. Weight is transferred by stepping with the foot opposite the throwing hand</td>
<td></td>
</tr>
<tr>
<td>4. Follow-through beyond ball release diagonally across the body toward the nonpreferred side</td>
<td></td>
</tr>
</tbody>
</table>
Motor Competence – measured at three time points
- (Pretest, Posttest, Retention Test)

**Throw Component (4 – 13 points)**
- Foot (step) Action (1-4 stages)
- Truck Action (1-3 Stages)
- Humerus action during forearm swing (1-3 Stages)
- Forearm action during forward swing (1-3 Stages)

**Throw velocity (m/sec)**
- Radar Gun in meters/second
Dependent Variables cont.

- Perceived Motor Competence (PMC) – measured at three time points
  - (Pretest, Posttest, Retention Test)
- Pictorial scale for Perceived Competence and Social Acceptance (Harter & Pike, 1984)
  - Physical Competence ONLY
  - 6 pictures, 1 – 4 rating and mean

- Throw item – Barnett Scale (1 – 4 points)
This girl is pretty good at throwing.
Are you:

Really good at throwing OR Pretty good

4  3

This girl isn't very good at throwing.
Are you:

Sort of good OR Not too good at throwing

2  1
Dependent Variables cont.

- Engagement – measured during intervention
  - Mean number of trials recorded in each session of the MATE Intervention and the Comparison Condition

- Compare Experimental vs. Comparison group
Independent Variables

- **MATE Intervention**

**TASK:**
- Variety of throwing tasks
- Difficulty progressively increases

**ENVIRONMENT:**
- Child centered
- Different levels of challenge
- Reward structure built into video game
- Motivating contexts

**INDIVIDUAL:**
- Track movements
- Target key movements (step & throw)
Independent Variables cont.

**Comparison Group**

**TASK:**
- Variety of throwing tasks
- Difficulty progressively increases

**INDIVIDUAL:**
- Track movements
- Target key movements (step & throw)

**ENVIRONMENT:**
- Group-based – teacher sets task
- Different levels of challenge
- No technology
Procedures

- Ethics
  - Site permission (school)
  - Parent permission
  - Child assent

- Measurement tools identified

- Training of coders for video analysis
  - Inter-rater reliability (95%)

- Evaluate 500 students for developmental delays using TGMD2
  - Students with delays identified

- Random assignment of students to MATE or comparison groups

- Pretest 5 variables

- MATE or comparison group
  - 10 weeks, 2x 15 minute sessions per week
  - Record number of trials (engagement)

- Posttest 5 variables

- Three weeks later retention test on 5 variables
**Data Analysis**

**Pretest:** ANOVA (no significant differences)

**During intervention:** ANOVA of mean engagement scores

**Following intervention:** Repeated measures ANOVA
- Intervention effect (2 Group (Experimental, Control) X 3 Time (Pretest, Posttest, Retention Test))
- Post hoc tests to determine where significant differences are (ANOVA + t-tests)
Journals

- Physical Education and Sport Pedagogy
- Journal of Motor Learning and development
- Research Quarterly for Exercise and Sport
Conferences

- Society of Health and Physical Educators (SHAPE)
- North American Society for the Psychology of Sport and Physical Activity (NASPSPA)
- AIESEP International Conference
Embrace MATE – the possibilities are endless.
References


Fidelity

- How to ensure the intervention is implemented as intended:
  - Video the sessions
  - Check sheet for MATE and comparison groups