Evaluating the relationship between physical activity, gross motor skills, and healthy growth in preschoolers using structural equation modeling

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Health Behaviors Lab
Eating | Activity | Community

LEAP! Eating and Physical Activity Study

Introduction

- Preschoolers' physical activity (PA) level and gross motor skill (GMS) proficiency are closely related.
- Preschoolers' health growth is likely related to both their PA and GMS; however, the directionality of the relationship between these variables is unclear.
- Baseline data from the Colorado **L**ongitudinal **E**ating **A**nd **P**hysical Activity Study (LEAP) used structural equation modeling (SEM) to explore the directionality of the relationship between PA and GMS in predicting healthy growth in preschoolers.

Methods

Participants

The LEAP study was conducted in 4 Head Start preschools in rural Colorado communities serving preschoolers (N=250)

Assessments

Gross Motor Skills and Fitness

- Bruininks-Oseretsky Test of Motor Proficiency, 2nd Ed. (BOT-2)

Physical Activity

- Actical accelerometers worn on non-dominant wrist for 7 days.

Healthy Growth (Body Mass Index (BMI))

- Height and weight were measured and used to calculate BMI.

Data Analysis

- Structural equation modeling tested two models using Mplus.
- Both models used the same latent variables: balance skills, locomotor skills, ball skills, PA, perceived physical competence (PPC), and fitness.
- All variables were regressed on preschooler ethnicity, age, and sex.
- Model fit was assessed using Chi-square ($\chi 2$) and root mean square error of approximation (RMSEA), with p >.05 and p <.05 as indicators of close fit, respectively.

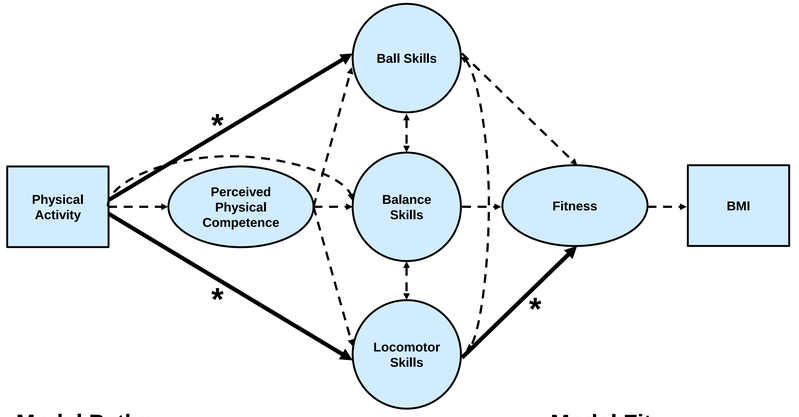
Results

TABLE: Participant demographics and descriptive data

Demographics	**All Participants (N=236)**
Age in months (Mean (SD))	55.89 (4.31)
Males (n (%))	104 (44.1%)
Hispanics (n (%))	97 (41.1%)
Preschooler BMI kg/m^2 (Mean (SD))	16.52 (2.40)
Selected Latent and Manifest Variables[1]	**Mean (SD)**
Fitness	
Shuttle run	3.06 (2.18)
Long jump	3.00 (1.54)
Wall sit	2.56 (1.81)
Moderate to vigorous physical activity (minutes)	
School day	1.59 (0.58)
Outside of school day	3.92 (3.40)
Weekend	6.70 (11.54)

[1]See handout for all latent and manifest variable descriptive statistics

Model 1: Physical activity predicting gross motor skills and gross motor skills predicting child BMI



Model Paths

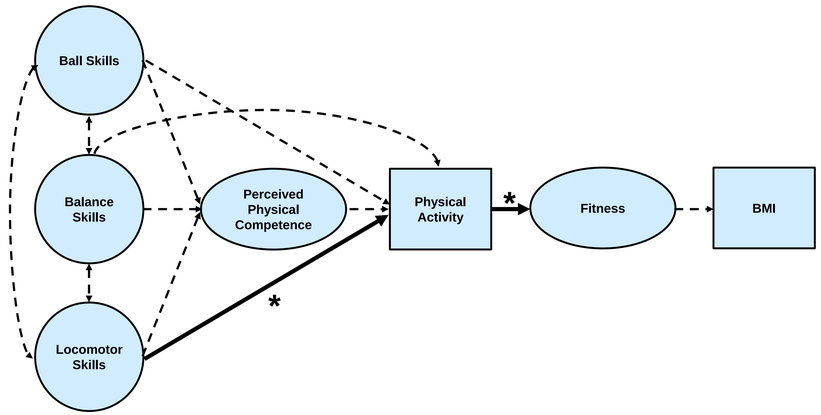
- PA predicted locomotor skills (b=0.499, p<.01)
- PA predicted ball skills (b=0.295, p=.006)
- Locomotor skills predicted fitness (b=0.668, p<.01)
- Fitness did not predict BMI (b=-0.176, p=.077)

Model Fit

- $\chi 2(556)=805$, p>.05
- RMSEA=.044

Results

Model 2: Gross motor skills predicting physical activity and physical activity predicting child BMI



Model Paths

- Locomotor skills predicted PA (b=0.568, p<.01)
- PA predicted fitness (b=0.711, p<.01)
- Fitness did not predict BMI (b=-0.132, p=.176)

Model Fit

- $\chi 2(558)=825$, p>.05
- RMSEA=.045

Conclusions

- Both models showed significant pathways from locomotor skills to PA, and vice-versa, suggesting the need for additional research to examine the potential for reciprocity between PA and locomotor skills.
- Ball skills were not predictive of PA, likely due to preschoolers' relatively low ball skill proficiency.
- Additional analyses will test individual latent variables in each model as mediators and will test direct paths from physical activity to fitness (model 1) and from physical activity to BMI (both models).
- Additional research is required to determine whether fitness or PA is a more appropriate predictor of health risk (BMI) in preschoolers.
- Longitudinal data are necessary to determine how the directionality of these relationships changes throughout child development, a next step for the Colorado LEAP study dataset.

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