

Adolescent Friendships, BMI, and Physical Activity: Untangling Selection and Influence through Longitudinal Social Network Analysis



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Introduction



- Adolescent obesity and low physical activity levels are rising public health concerns in the United States
 - Spruijt-Metz, 2011
- Bioecological theory (Bronfenbrenner & Morris, 2006)
 - Need to examine of the contextual influences

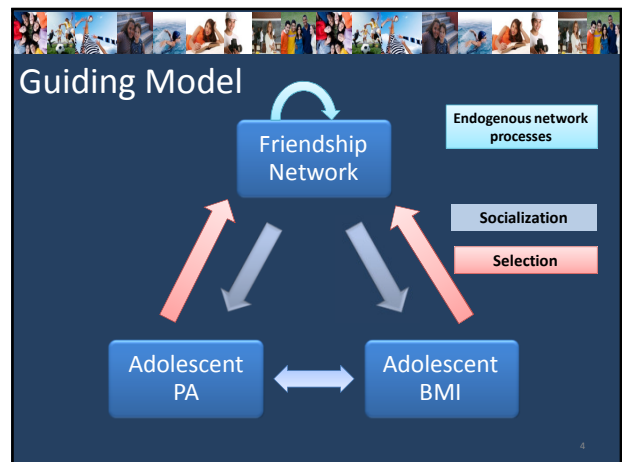
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Friendships



- Friends tend to be similar on
 - BMI
 - (e.g., Valente et al., 2009)
 - PA
 - (e.g., Duncan et al., 2007)
- Why?

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Previous Research



- BMI
 - Evidence for selection based on similarity, but not socialization (de la Haye et al., 2011a)
 - Adolescents may be less likely to select heavier peers as friends (Crosnoe et al., 2008; Janssen et al., 2004)
- PA
 - Evidence for selection based on similarity, and socialization (de la Haye et al., 2011b)

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Hypotheses



- Selection
 - Less likely to select friends who are overweight or have lower physical activity
 - Will select friends with similar BMI and physical activity
- Socialization
 - Friends' BMI and physical activity would predict adolescents' subsequent BMI and physical activity
 - Friend influence on physical activity may account for the influence of friends' BMI on adolescents' BMI

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The Methods

Add Health Study

	School A	School B
Type	Public	Public
Location	Rural	Suburban
Region	Midwest	West
Number of students	1,024	2,104
Response rate (%)	76	83

Participants

	School A (n = 667)	School B (n = 1,229)
Gender (% female)	46.6	48.1
Race (%)		
White	93.7	4.3
African American	0.0	21.8
Hispanic	0.7	40.2
Asian American	0.6	21.6
Age in years M(SE)	15.74(1.18)	16.08(1.01)
Income in thousands M(SE)	48.39(28.04)	38.39(23.08)

- ## BMI & PA
- **BMI**
 - Based on self-reported height and weight
 - CDC weight status categories based on their BMI percentile:
 - underweight (<5th percentile)
 - healthy weight (5th percentile to <85th percentile)
 - overweight (85th percentile to <95th percentile)
 - obese (≥95th percentile)
 - **Physical Activity**
 - "an active sport, such as baseball, softball, basketball, soccer, swimming or football"
 - "roller-blading, roller-skating, skate-boarding, or bicycling"
 - "exercise, such as jogging, walking, karate, jumping rope, gymnastics or dancing"
 - 0 = not at all, 1= 1 or 2 times, 2 = 3 or 4 times, 3= 5 or more times

BMI & PA

	School A	School B
BMI T1		
Underweight	2.4%	1.6%
Healthy	76.3%	68.8%
Overweight	11.2%	14.1%
Obese	9.6%	13.8%
% increase T1-T2	5.70%	5.53%
% decrease T1-T2	5.85%	7.49%
Physical activity T1	3.79(2.09)	3.67(2.03)
%increase T1-T2	0.15%	27.42%
% decrease T1-T2	39.88%	40.28%

- ## Friendships and Control Variables
- **School-based friendships**
 - Nominated 5 closest female and 5 closest male friends
 - **Control variables**
 - Age, Race, Gender
 - Self-esteem
 - Eat breakfast
 - Parent indicators
 - Income, education
 - Obesity
 - Co-participation in physical activity
 - School settings
 - Course-overlap
 - Extracurricular participation

Analysis Plan

- Stochastic Actor Based (SAB) model
 - Predicting friendship ties
 - Ego, alter, similarity on BMI & PA
 - Ego, alter, similarity on several controls
 - Endogenous network processes (e.g., reciprocity)
 - Predicting adjustment
 - Similarity (i.e., friend influence)
 - Individual control variables (e.g., parent obesity)

The Results

Predicting Friendship Ties

	School A Coefficient(SE)	School B Coefficient(SE)
BMI		
Alter	0.02 (.04)	-0.04 (.05)
Ego	0.08 (.04) ^a	-0.04 (.06)
Similarity	0.41 (.13) ^{***}	0.74 (.18) ^{***}
Physical activity		
Alter	0.06 (.01) ^{***}	0.00 (.02)
Ego	0.04 (.02) [*]	-0.03 (.02)
Similarity	0.45 (.26) ^a	1.35 (.58) ^{**}
Endogenous network processes		
Reciprocity	-- --	-- --
Transitive triplets	-- --	-- --
Popularity	-- --	-- --

	School A Coefficient(SE)	School B Coefficient(SE)
BMI		
Alter	-0.02 (.04)	0.04 (.05)
Ego	0.09 (.04) [*]	0.10 (.06)
Similarity	0.18 (.14)	0.53 (.16) ^{***}
Physical activity		
Alter	0.04 (.02) [*]	0.00 (.03)
Ego	0.00 (.02)	-0.06 (.03)
Similarity	0.08 (.31)	0.35 (.46)
Endogenous network processes		
Reciprocity	2.24 (.07) ^{***}	2.59 (.12) ^{***}
Transitive triplets	0.40 (.02) ^{***}	0.61 (.50) ^{***}
Popularity	0.14 (.03) ^{***}	0.21 (.05) ^{***}

Predicting BMI & PA

Predicting BMI

	School A	School B
	Coefficient(SE)	Coefficient(SE)
Individual attributes		
Female	0.37 (.51)	-0.22 (.27)
Age	0.03 (.23)	-0.02 (.18)
Income	0.01 (.01)	-0.02 (.01)
Hispanic ^a	--	0.48 (.58)
African American ^a	--	-0.23 (.58)
Asian American ^a	--	0.27 (.61)
Other race ^a	--	0.05 (.77)
Self-esteem	-0.38 (.44)	0.25 (.22)
Breakfast	0.23 (.61)	-0.80 (.34)**
Sport participation	-0.99 (.67)	-0.07 (.32)
Parents' obesity	1.10 (.63)	0.69 (.43)
Physical activity	0.05 (.20)	0.15 (.11)
Friend influence effects		
Total similarity	3.31 (1.51)*	1.69 (.79)*

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Predicting Physical Activity

	School A	School B
	Coefficient(SE)	Coefficient(SE)
Individual attributes		
Female	-0.07 (.04)	-0.09 (.03)***
Age	-0.01 (.02)	-0.03 (.02)
Income	0.00 (.00)	0.00 (.00)
Hispanic	--	0.09 (.07)
African American	--	0.06 (.07)
Asian American	--	0.13 (.07)
Other race	--	0.12 (.09)
Self-esteem	0.10 (.04)**	0.01 (.02)
Breakfast	0.09 (.05)	0.03 (.03)
Sport participation	0.09 (.05)	0.05 (.04)
Parents' co-participation	0.05 (.05)	0.04 (.04)
BMI	0.01 (.03)	0.03 (.02)
Friend influence effects		
Total similarity	0.46 (.18)**	0.46 (.24)

• Friend influence on PA did not explain friend influence on BMI.

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Discussion

- ### Friend Selection
- Evidence for selecting friends who have similar BMI
 - However, these friendship patterns largely emerged through friend selection based on *other* factors and not because of selection based on BMI.
 - Possible explanations
 - Amplification
 - Small selection effects are amplified over time through endogenous network processes
 - Consolidation
 - Friend selection based on attributes related to health, such as extracurricular participation

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