Changes in school-based friendship networks and physical activity in children following school-grade transition: A natural experiment

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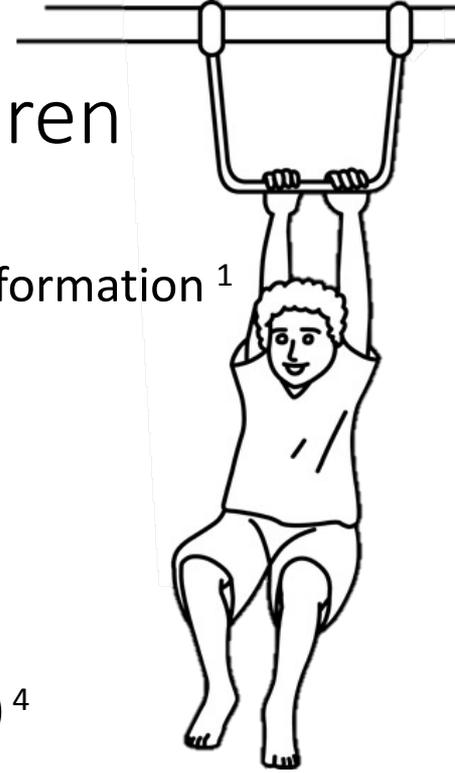
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Physical activity & friendship in children

- Regular physical activity (PA) participation may lead to friendship formation [1]

- Peer friendships have an influence on individual PA

    - Friends have similar levels [2]

    - Activity levels may become more similar over time [3]

    - Theories of social cognition (peer modelling, social facilitation) [4]

- PA differences may relate to social differences among boys and girls [5]

- No studies have investigated this relationship over transition to a higher school grade

[1] Smith (2003). *Peer relationships in physical activity contexts: A road less traveled in youth sport and exercise psychology research.* Psychology of Sport and Exercise.
[2] Sawka et al. (2014). *Associations between Aspects of Friendship Networks, Physical Activity, and Sedentary Behaviour among Adolescents.* Journal of Obesity.
[3] De La Haye et al. (2011). *How physical activity shapes, and is shaped by, adolescent friendships.* Social Science & Medicine.
[4] Salvy et al. (2012). *Influence of peers and friends on children's and adolescents' eating and activity behaviors.* Physiology & Behavior.
[5] Poulin & Chan (2010). *Friendship stability and change in childhood and adolescence.* Developmental Review.

Study aims

- To examine the associations between children's PA and their position in their friendship network

- To investigate whether changes in children's position within the friendship networks are associated with changes in PA over transition to a new school year

- Assess for modification according to sex

Survey instruments

- Children invited to complete in-class **Health** and **Social Network surveys**

Health Survey

- Covariates

  - *Socio-demographics*

    - Sex (boy, girl)

    - Age

    - Residential mobility (# times moved homes in last 12 months)

    - Years residing in Canada

    - Family affluence (vehicle ownership, computer ownership, holiday travel over the last 12 months, child having their own unshared bedroom) [1]

- Dependent variable

  - *Days per week of moderate-to-vigorous PA (MODPA) participation* [2]

    - Frequency of achieving ≥ 60 minutes MODPA over **last** week

    - Frequency of achieving ≥ 60 minutes MODPA over **'usual'** week

    - Two items were combined, averaged into a single PA index from 0 to 7

Social Network Survey

- Independent variables

  - *"Who are you friends with?"*

[1] McCormack et al. (2011). *Associations between familial affluence and obesity risk among children.* Paediatrics & Child Health.

[2] Prochaska et al. (2001). *A physical activity screening measure for use with adolescents in primary care.* Archives of Pediatrics & Adolescent Medicine.

Study & sample design

	Pre-transition	**Post-transition**
Time period surveyed*	1, 2	3, 4, 5
Grades surveyed	5, 6, 7	6, 7, 8
# children eligible (n)	294	399
Sample size (n)	191	255
Response rate (%)	65%	64%

- Averaged pre-transition (times 1-2) and post-transition (times 3-5) measures

- Change scores (n=130) estimated by subtracting pre-transition from post-transition PA and SN data
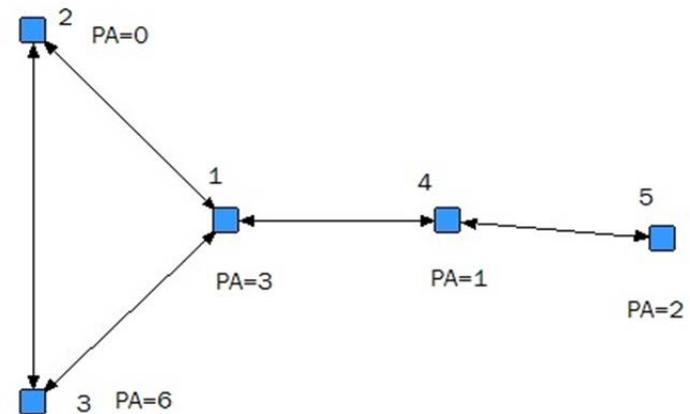
* Data collection occurred at 5 separate time points between **March 2011 and April 2012**. Children transitioned school grade in September 2012.

Social Network Variables (UCINET)

- Social (friendship) networks describe the relations between individuals [1]

- Captured a child's **position** within their **friendship networks**:

  - Friends' average PA

  - Incoming number of friends

  - Outgoing number of friends

Table 1. Sample matrix for a network of 5 children

Child ID #	1	2	3	4	5
1	0	1	1	1	0
2	1	0	1	0	0
3	1	1	0	0	0
4	1	0	0	0	1
5	0	0	0	1	0

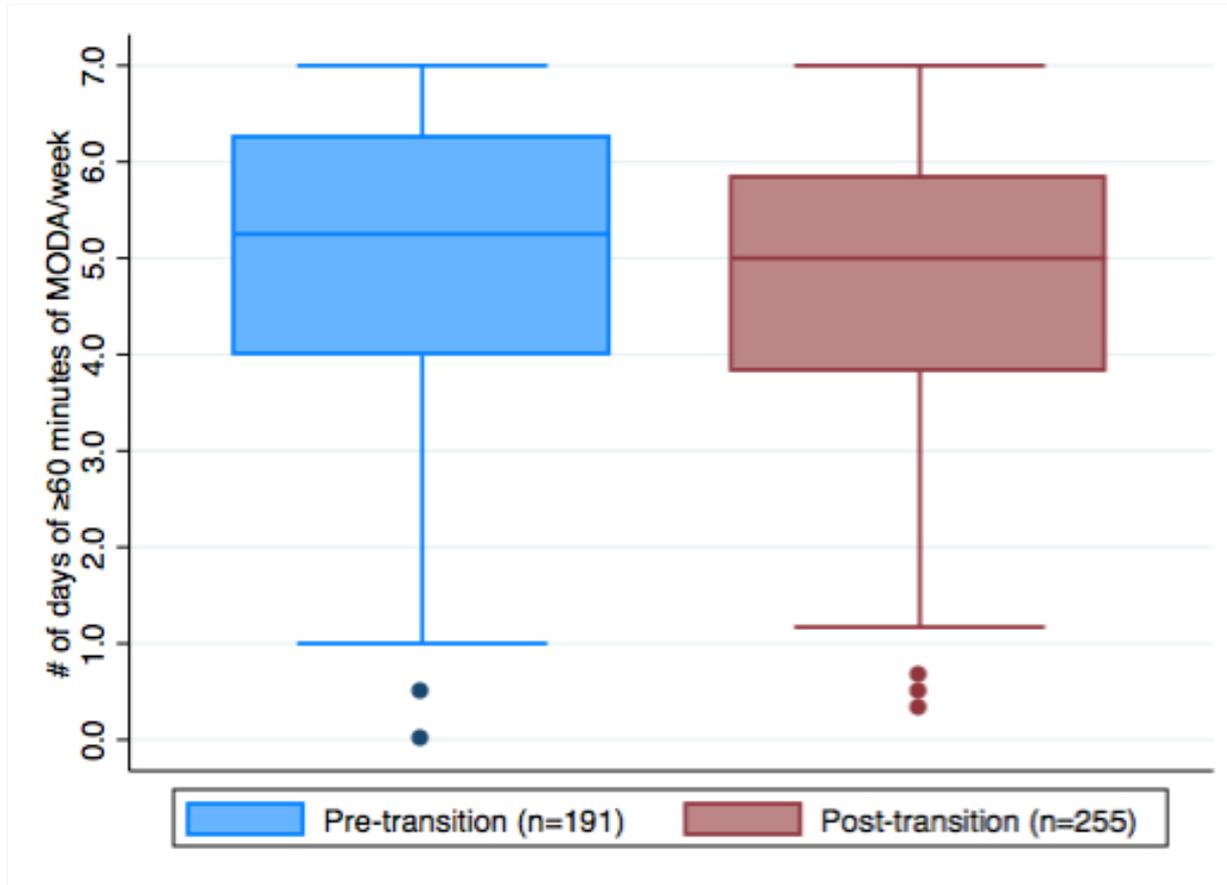**Figure 1. Sociogram for Table 1; shows children's network positions**

[1] Borgatti (1998). *Ego networks*. Social Network Analysis Instructional Web Site. www.analytictech.com/networks/egonet.htm

Statistical analysis (SPSS)

- Multivariable linear regression modelling (β) and 95% confidence intervals (95% CI)

  - Adjusted for socio-demographics

  - Including sex-interaction terms for each friendship network measure

    - Sex x friends' average PA

    - Sex x incoming number of friends

    - Sex x outgoing number of friends

- Separate cross-sectional analysis for pre-transition, post-transition, and change scores

- Backwards stepwise elimination (Likelihood ratio)

- All statistical analysis performed using significance level (α) of 0.05

Results

Average PA participation in days/week

Results

Pre-transition (times 1-2) cross-sectional reduced model (**n=191**)$^{+}$

	β (95%CI)
Social network variables	
Friends' average PA	**0.82 (0.40, 1.25)***
Incoming friendship nominations	-
Outgoing friendship nominations	**2.18 (1.28, 3.09)***
Family affluence scale	
Low (<6)	Ref
Medium (6-7)	-0.05 (-0.60, 0.51)
High (≥8)	0.47 (-0.11, 1.04)
Constant	-0.13 (-2.38, 2.12)
R^2	0.18

+ Reduced model: included backwards elimination (Likelihood ratio) of all non-significant (p≥.05) main effects and sex x SN variable interactions

* Statistically significant (p<0.05)

Results

Post-transition (times 3-5) cross-sectional reduced model (**n=255**)$^+$

	β (95%CI)
Social network variables	
Friends' average PA	**0.80 (0.37, 1.22)***
Incoming friendship nominations	-
Outgoing friendship nominations	**2.26 (1.33, 3.20)***
Family affluence scale	
Low (<6)	Ref
Medium (6-7)	0.21 (-0.23, 0.65)
High (≥8)	**0.62 (0.17, 1.07)***
Constant	-0.06 (-2.15, 2.03)
R^2	0.19

$+$Reduced model: included backwards elimination (Likelihood ratio) of all non-significant (p≥.05) main effects and sex x SN variable interactions

* Statistically significant (p<0.05)

Interpretation of results

- Aspects of children's friendships **are** related to their individual PA

  - The higher the activity level of friends, the higher the child's PA

  - The more friends a child nominated, the higher their PA

- Friendship type is an important consideration

  - Incoming friendship nominations vs outgoing

- No evidence for boy/girl differences

- Changes in position within friendship networks via school grade transition may not be associated with PA

Study limitations

- One public middle school in Calgary, Canada

- Self-report measures

- PA outside of Physical Education class, not context-specific

- In-school friendships only

- Low sample size for change scores (n=130)

'I like hanging out with you Victoria'

Conclusions

- Children's positions within their peer friendship networks are related to their PA

- Social context of PA may be important

- Future studies may benefit from using context-specific PA measures and capturing out-of-school friendships

  - In what context were children physically active?

  - With whom?

Acknowledgements

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Canadian Institutes of Health Research   Instituts de recherche en santé du Canada

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