Supplemental Information

SOCIAL NETWORK DATA ANALYSIS

To aid the reader familiar with stochastic actor-based models, we describe our modeling in detail below. Sociometric data used within the following models were created by combining information on network ties between children in each of the afterschool settings ($n = 46$, and $n = 35$, respectively) into a series of 81 $\times$ 81 actor matrices. Potential ties between children not in the same afterschool program were precluded by coding the appropriate cells as "structural zeros."[38] ‡ Model parameters will be described in 2 sections: selection effects, those parameters that describe dynamics within the children's social networks, and influence effects, those parameters that relate to changes in activity behaviors.

Test of the Hypothesized Selection Effect

To evaluate what influence activity level may exert over friendship choice we include 3 parameters: the "ego," "alter," and "similarity"[38] effects of children's activity levels. These terms capture a given variable's effect on the propensity to initiate friendship ties (ego), the propensity to receive them (alter), and the propensity for individuals with similar covariate values to form ties (similarity). In addition to these, individual-level attributes such as age, gender, and whether a child was obese (BMI $\geq$ 95th percentile) were included (all with the corresponding ego, alter, and similarity terms). Dyadic covariates allow for evaluation of the tendency for ties to form between actors who share certain characteristics. Three dyadic covariates were included to denote those pairs of children who lived in the same household, identified as having the same racial background, or attended the same school. The typical modeling process within the SIENA framework allows for a number of endogenous network controls as well. These control variables capture social network phenomena that are observed consistently across very diverse social milieu. Included in this model were outdegree (the tendency for actors to form ties within the network), reciprocity (the tendency to reciprocate a received friendship tie), transitive triplets (the tendency for a friend of a friend to become a friend), as well as "3-cycles," a variant of transitive triplets.[38] Significant parameters for these terms indicate changes in the log odds of tie formation across the observed values of each.

Test of the Hypothesized Influence Effect

To examine whether activity behaviors were influenced by social ties, we relied on 3 parameters: activity level-indegree (the effect of receiving friendship nominations based on level of activity), activity level-outdegree (the effect of initiating friendship ties on physical activity), and activity level-similarity (the tendency for a child to adjust their activity levels to match the average activity level of their friends). Controls for the influence portion of the model included the linear shape function, which captures the overall tendency for physical activity; the quadratic shape function, which accounts any for possible self-reinforcing feedback (activity leading to more activity); as well as terms to model the direct effects of age, gender, and obesity on level of activity. To control for possible differences in activity level due to potential subtle differences in the nature of each afterschool program, a control variable was added that signified the program site in which each child was enrolled. Significant parameters for these terms indicate changes in the log odds of adjusting one's activity level across the observed characteristics of each child's personal network.

RESULTS OF SIENA MODELING

Results from the SIENA analysis are given in Table 5. Two models, a basic and a full model, are presented here, as is best practice in reporting SIENA results. The basic model included essential network selection and influence effects. The full model combined the effects from the basic model with all relevant control variables. In each model, selection and influence effects are estimated simultaneously, each controlling for effects in the other.

Basic Model, Selection Effect

In the selection portion of the basic model, rate-of-change parameters for both periods were large, positive, and highly statistically significant (from wave 1 to wave 2: 7.67, $P < .01$; from wave 2 to wave 3: 4.54, $P < .01$). The outdegree parameter of the basic model was included as a necessary control; that it was negative and highly significant (-1.17, $P < .01$) indicated the general tendency away from having very large numbers of friendship ties in the

‡Early iterations of the present statistical model were pursued in which the networks and behavior of each afterschool setting were modeled independently. These attempts were plagued by poor model convergence throughout and were abandoned.

network, which is a finding common to the vast majority of studies of this nature. Reciprocity, the tendency to reciprocate an incoming friendship tie, was positive and significant (1.00, $P <$ .01). The activity level-similarity term evaluated whether friendship ties were more or less likely between 2 given children with similar activity levels. Within the basic model, this parameter was positive and significant (1.82, $P <$ .01), lending preliminary support for the notion that children preferred friendships with others of a similar activity level.

Basic Model, Influence Effect

In the influence portion of the basic model, statistically significant rate parameters indicated that children in this study made nontrivial changes to their activity level across time (from wave 1 to wave 2: 3.89, $P <$ .01; from wave 2 to wave 3: 11.63, $P <$ .10). Neither the linear shape nor the quadratic shape terms were statistically significant, indicating that there was no general upward or downward trend in activity at the group level. The activity level-indegree term indicated the extent to which children's incoming ties were significant predictors of activity levels; in the basic model, we saw a very small and nonsignificant effect. The activity level-outdegree term described the tendency for outgoing ties to influence the activity levels of others; in the basic model, this parameter was also small and nonsignificant. The activity level-average similarity term described the tendency for a child to adjust his or her activity level to the average activity level of all alters, whether connected by incoming, outgoing or reciprocal ties. In the basic model, this was a very large and highly significant parameter (15.47, $P <$ .01), indicating a very strong tendency for children to adopt the average activity level of their friends.

Full Model, Selection Effect

The full model included all parameters of the basic model and added a series of control variables for both selection and influence. As in the basic model, we obtained large and highly significant parameters for rate of change in the friendship network, with changes in the first period (9.80, $P <$ .01) once again greater than changes in the second period (4.95, $P <$ .01). Both outdegree (-1.77, $P <$ .01) and reciprocity (0.69, $P <$ .01) retained their respective signs and statistical significance. The transitive triplets term (0.28, $P <$ .01) indicated the log-likelihood of forming a tie where transitive closure would occur. This, together with the negative term for 3-cycles (-0.18, $P <$ .01), indicated the regular occurrence of hierarchical patterns of relation in these friendship networks. Within the full model, controls for racial identification (0.25, $P <$ .01), attending the same school (0.58, $P <$ .01), being the same gender (0.44, $P <$ .01), and being a similar age (0.88, $P <$ .01) all increased the odds of forming a friendship tie. There were no statistically discernable differences between obese and nonobese children in terms of the friendship nominations they made or received. In other words, these data suggest that obese children were no more or less attractive as friends, and did not name more or fewer friends than nonobese children.

Research Question 1: The test of a selection effect yielded activity level: alter, ego, and similarity terms indistinguishable from zero. Thus, we found no support for the notion that children make or break friendship ties based on physical activity. Across all levels of physical activity we found consistent patterns in the propensity to make and receive friendship ties with other children. Additionally, there was no significant tendency for children of similar initial activity levels to choose each other as friends.

Full Model, Influence Effect

The influence portion of the full model confirmed the pattern of changes in activity level for the first period (3.94, $P <$ .01) and but not the second period (16.45, $P =$ .63), suggesting that individual children significantly changed their activity levels over the first study period. The linear and quadratic shape terms remained insignificant, confirming that there was no upward or downward trend in activity level at the group level.

Research Question 2: The test of an influence effect yielded nonsignificant terms for both activity level-indegree and activity level-outdegree. This indicated that activity level was not affected by a child's number of outgoing or incoming friendships. However, the activity level-average similarity term in the full model retained its sign, magnitude, and statistical significance (17.37, $P <$ .01), indicating that children are very likely to adjust their activity level to the average level of their immediate group of friends. To illustrate the magnitude of this finding, consider a child with a MVPA level in the 20% decile category, and whose friends have an average MVPA level in the 30% category. The average similarity term here expresses the log odds of making a maximally large adjustment in activity level (across the full range of the variable); our example supposes that we move 1 category, or one-ninth of the maximum adjustment. The odds of making a 1 category change in activity level would thus be exp(17.37/9), or OR = 6.89 ($P <$ .01). Although controls for the direct effect of age (-0.07, $P <$ .10) and obesity (-0.41, $P <$ .10) on activity were marginally significant, they were relatively small in comparison with the effect of the average activity level of a child's immediate friends. Gender had no direct effect on activity.