Abstract Title Page

Title: Measuring Teachers' Attunement to Children's Friendships, Victimization, and Popularity Dynamics

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Abstract Body
Limit 4 pages single-spaced.

Background / Context:
Description of prior research and its intellectual context.
Educational researchers have long recognized that teachers have an "invisible hand" with which they can subtly shape students' relationships (Cairns & Cairns, 1994; Gest & Rodkin, 2011; Gronlund, 1959). Through seating arrangements, instructional groups, and general classroom management strategies, teachers have many opportunities to shape friendships and status dynamics in the classroom. To use their invisible hand effectively, however, teachers likely need to be attuned to the classroom social dynamics (Farmer, Reinke, & Brooks, 2014). This *attunement* can be thought of as the extent to which teachers' perceptions of the social relationships in the classroom are consistent with student reports.

There is growing interest in helping teachers become aware of classroom social dynamics, with a particular emphasis on helping teachers become attuned to friendships and peer cliques. For example, a middle school intervention aimed at fostering positive development during the critical years of early adolescence trained teachers to recognize cliques in the classroom (Hamm et al., 2011). More recently, researchers have become interested in teachers' attunement to other social dynamics, such classroom status dynamics (e.g., popularity) and victimization (Gest, Madill, Zadzora, Miller, & Rodkin, 2014; Serdiouk, Rodkin, Madill, Logis, & Gest, 2013).

Purpose / Objective / Research Question / Focus of Study:
Description of the focus of the research.
The primary purpose of this study is to describe the estimation and resulting properties of a set of classroom-level attunement indices. Specific objectives are as follows:

1. **Estimate teachers' attunement to three aspects of classroom social dynamics: friendship, victimization, popularity**. Estimates must account for factors unique to each social dynamic, such as the potential consequences of overlooking an extremely victimized child relative to overlooking a moderately victimized child.
2. **Examine the validity of each index of attunement.** An observational measure of teachers' responsiveness serves as a validating index.
3. **Identify features of the classroom network that are associated with teachers' attunement**. For example, network density and centralization of different social ties could affect a teacher's ability to be attuned, as may student mobility.
4. **Examine teachers' attunement scores at three time points within a school year.** Do attunement indices increase over the year? Do teachers maintain rank-order stability?

In addition, the study describes how we developed an index of teachers' attunement to an individual child's friendships.

Setting:
Description of the research location.(May not be applicable for Methods submissions)
Participants were drawn from the Classroom Peer Ecologies Project, a multi-year study of teaching practices, peer relationships, and student outcomes. School districts in the Midwest and

Northeast provided both ethnically diverse and homogenous schools from rural areas, small-to mid-sized cities, and an urban center.

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features, or characteristics.
(May not be applicable for Methods submissions)
At Time 1 (T1), there were 2,454 children enrolled in 113 classrooms (37 1st-grade, 35 3rd-grade, and 41 5th-grade). Of these children, 2,056 (84%) participated. Classroom participation rates ranged from 63% -100%. Child and classroom characteristics were similar at T2 and T3. Preliminary results presented below are from 54 classrooms; 44% of children in these classrooms received free or reduced-price lunch. Children were African American (47%), White (28%), or Hispanic (15%). Final results will be presented for all 113 classrooms.

Intervention / Program / Practice:
Description of the intervention, program, or practice, including details of administration and duration.
(May not be applicable for Methods submissions)
This study does not involve an intervention.

Significance / Novelty of study:
Description of what is missing in previous work and the contribution the study makes.
Although recent research has begun to recognize the potential importance of teachers' attunement to victimization and popularity in the classroom, in addition to attunement to friendships and clique membership, little is known about the properties of these new indices, such as their stability over time and validity. Moreover, little is known about network features that might influence attunement indices. For example, Neal and colleagues (2011) found that teachers' attunement to peer groups was higher in more dense networks, presumably because relationships in dense networks stronger and more visible to teachers. No such information has been established for attunement to popularity and victimization.

Previous work has neglected the potential importance of examining both within-classroom differences in attunement to friendships as well as between-classroom differences in teachers' attunement to friendships. For example, it may be that a teacher can improve the social experiences of a single child as a result of being attuned to that child's friendships, regardless of the teacher's attunement to other children's friends. Alternately, given the interdependence of children's social relationships, it may be necessary for teachers to have a high level of attunement across all children in order to successfully modify a single child's friendships.

Statistical, Measurement, or Econometric Model:
Description of the proposed new methods or novel applications of existing methods.
Estimating Classroom-Level Attunement Indices. *Friendship attunement* was calculated as a Jaccard similarity coefficient, following procedures outlined in Neal et al. (2011). This index accounts for teachers' errors of omission (i.e., overlooking a friend) and errors of commission (i.e., the teacher naming a friend that the child does not name). *Victimization attunement* was calculated as a modified error-of-omission calculation. Teachers were penalized for overlooking highly-victimized children, relative to moderately-victimized children. *Popularity attunement* was calculated as the correlation between teacher-rated popularity for children and children's

peer-rated popularity. Methods for estimating these indices of attunement are outlined in Gest et al., 2014.

Estimating Individual-Level Friendship Attunement. Teachers' attunement to a single child's friendships was estimated using a modified Jaccard similarity coefficient. We were interested in penalizing teachers who named zero friends for a child based on the number of friends that the teacher overlooked. The modified Jaccard similarity coefficient adds a "1" to the numerator and denominator to achieve this goal.

Usefulness / Applicability of Method:
Demonstration of the usefulness of the proposed methods using hypothetical or real data.
We applied the attunement estimates to a study that is described in greater detail below. In addition, attunement indices described above have been applied in several recent studies (Gest et al., 2014; Serdiouk et al., 2014). Results from these studies indicate that attunement may be related to children's adjustment, especially when combined with other effective teaching strategies (e.g., responsive teaching; Gest et al., 2014).

Research Design:
Description of the research design. (May not be applicable for Methods submissions)
Short-term longitudinal data were collected from different classrooms each year. Time 1 (T1) data were collected within two months of the first day of school, Time 2 (T2) data were collected approximately two months later, and Time 3 (T3) data were collected approximately 6 weeks before the end of the school year. The present study uses data from the third and fourth years of the project. At every time point, teachers and children responded to surveys and observers completed a classroom observation of teacher-child interactions.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.(May not be applicable for Methods submissions)
Children and teachers completed written surveys at each of the three time points.

Victimization. **Children** identified classmates who were victimized by peers ("These are the kids who are always getting picked on, being made fun of, called bad names, even hit or pushed." A child's victimization score was calculated as the proportion of classmates naming a child. **Teachers** were asked to name classroom bullies and the kids they pick on.

Popularity. **Children** responded to two items assessing popularity: "These are the kids who are popular" and "These are the kids who are not popular." For each item, a child's score was calculated as the proportion of classmates naming as popular. Overall perceived popularity was "popular" minus "not popular." **Teachers** indicated each child's popularity with girls and popularity with boys on a scale of 1–5; scores were averaged. Teachers only responded to this item at T1 and T3.

Friendships. **Children** were asked to circle the names of their friends on a provided roster. Only friendships that were reciprocated were retained for the present study. **Teachers** were asked, "Please list this student's CLOSE friends and OTHER friends from your classroom."

Classroom network statistics. *Density* of each type of tie (friendship, victimization, popularity) was computed as the number of nominations sent in the classroom divided by all possible nominations. Each child received a *centrality* score for each type of tie, calculated as the nominations received by peers, rescaled such that the sum of all centrality scores in the classroom equaled 1. Children's centrality scores were summarized within a classroom with a *centralization* index, which represents the extent to which nominations are evenly spread across the classroom, or concentrated among a few children. A score of 1 represents a classroom in which one child receives all nominations for the behavior (Wasserman & Faust, 1994).

Findings / Results:
Description of the main findings with specific details.(May not be applicable for Methods submissions)
As shown in Table 1, there was variation in teachers' level of attunement. Only popularity attunement was associated with higher responsiveness (see Table 1).
(Insert Table 1 here)
None of the attunement indices were correlated with the density or centralization of the classroom friendship network. Victimization attunement was higher in classrooms with less dense victimization and popularity networks (i.e., classrooms in which fewer classmates were nominated for these traits). Popularity attunement was higher in classrooms with more centralized victimization and popularity networks. Teachers in classrooms with higher student mobility were less attuned to victimization. Consistent with previous research (Neal et al., 2011), attunement tended to be higher in upper grades.

Among the preliminary sample of 16 teachers with friendship attunement available for all three time points, correlations indicated high stability in friendship attunement from T1 to T2 ($r = .79$) and T2 to T3 ($r = .90$). Paired-sample t-tests showed a significant increase in attunement from T1 to T2 ($t = 1.85$, $p = .09$), but not from T2 to T3 ($t = -0.47$, $p = .64$). Final results will include the stability and change of attunement to victimization and popularity as well.

Finally, the individual-level attunement variable performed well. Attunement indices for individual children ranged from .08 – 1 ($M = .45$, $SD = .19$). Teachers were significantly more attuned to children who were central to the classroom friendship network ($r = .11$), less attuned to children who were central to the classroom victimization network ($r = -.09$), and more attuned to children who were central to the classroom popularity network ($r = .19$).

Conclusions:
Description of conclusions, recommendations, and limitations based on findings.
Teachers' variation in attunement did not depend on the number of classroom friendships, or the extent to which friendships were hierarchical. Attunement was, however, strongly related to popularity and victimization networks. One possibility is that more centralized networks make it easier for teachers to identify the children who are most popular or most victimized. Similarly, teachers were most attuned to the friendships of individual children who are more salient, in terms of friendships and popularity. Teachers were less attuned to the friendships of victimized children. Findings from the present study suggest that high attunement, alone, may not be a desirable feature in a classroom. Instead, attunement may be a "symptom" of a potentially harmful classroom network. Teachers may benefit from tools, such as evidence-based classroom management strategies, that allow them to use their high levels of attunement to actually improve classroom social dynamics.

Appendices

Appendix A. References

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Wasserman, S., & Faust, K. (1994). Social network analysis: Methods and applications. *Structural analysis in the social sciences.* New York: Cambridge University Press.

Appendix B. Tables and Figures

Table 1. *Descriptive Statistics for Attunement, Classroom Network Features, and Classroom Demographics*

		N	Mean	(SD)	Min.	Max.	1.	2.	3.
		\multicolumn{5}{c}{Descriptive Statistics}			\multicolumn{3}{c}{Correlations}		
Attunement Indices									
1.	T1 Friendship Attunement	54	0.25	(0.11)	0	0.58	1.00	-0.08	0.06
2.	T1 Victimization Attunement	54	0.52	(0.32)	0.06	1.00	-0.08	1.00	0.19
3.	T2 Popularity Attunement	54	0.60	(0.20)	-0.01	0.93	0.06	0.19	1.00
Teacher-Child Interactions									
4.	Responsive Teaching	54	4.10	(1.20)	1.16	6.35	-0.04	0.07	**0.32**
Classroom Network Features									
5.	Friendship Density	54	0.33	(0.09)	0.17	0.57	-0.02	-0.03	0.19
6.	Friendship Centralization	54	0.21	(0.07)	0.07	0.42	0.07	0.06	-0.04
7.	Victimization Density	54	0.13	(0.05)	0.06	0.33	0.00	**-0.44**	-0.17
8.	Victimization Centralization	54	0.27	(0.17)	0.04	0.80	**0.43**	-0.01	**0.42**
9.	Popularity Density	54	0.25	(0.07)	0.12	0.52	0.16	**-0.36**	0.18
10.	Popularity Centralization	54	0.28	(0.11)	0.13	0.61	0.19	0.13	**0.40**
Classroom Demographics									
11.	Mobility	54	0.11	(0.09)	0.00	0.40	-0.10	-0.27	-0.11
12.	Percent Minority	54	0.70	(0.21)	0.30	1.00	-0.02	-0.16	-0.19
13.	Percent Girl	54	0.46	(0.08)	0.26	0.68	-0.19	0.02	0.01
14.	Grade	54	2.85	(1.64)	1.00	5.00	**0.41**	0.11	**0.40**
15.	Teacher Years Experience	53	12.42	(11.48)	0.00	43.00	0.09	-0.04	-0.08

Note. **Bold** = *p* < .05