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How Context and the Perception of Peers' Behaviors Shape Relationships in Adolescence

Palacios, Diego

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Examining the role of academic performance, prosocial behavior and friendships on adolescents' preferred studying partners

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3.1 Introduction

Academic behavior in adolescence is a key determinant for future educational chances and career opportunities (Crosnoe & Benner, 2015). Whereas some students work on their assignments, get good grades, and attend school regularly, others skip school and exhibit school misconduct and low effort in school work (Bissell-Havran & Loken, 2009; Demanet & Van Houtte, 2012). Academic behavior is strongly influenced by the social relations in which it is embedded. For example, in dealing with academic tasks, adolescents not only rely on their own problem-solving skills but also seek help and assistance from others (Van Rijsewijk, Oldenburg, Snijders, Dijkstra, & Veenstra, 2018).

Starting in early adolescence, peers take up a central role as sources of help (del Valle et al., 2010). As adolescents spend a significant amount of time with each other (Altermatt & Pomerantz, 2003), peers constitute an important developmental context for adolescent academic behavior (Rodkin & Ryan, 2012), providing support and resources to either promoting or discouraging attitudes and behaviors that contribute to school success, such as school involvement, motivation, and disruptive behavior in class (Kindermann, 2007; Molloy et al., 2011). Because of their proximity and direct interaction with classmates, peers have a unique perspective on classmates' academic behavior, observing, for example, their grades and the speed and ease (or difficulty) with which classmates perform in their assignments, invest effort on tasks, and give or receive help. Students often turn to their peers for help when facing challenges or difficulties (Ryan & Shin, 2011) as they provide valuable academic and social support (Altermatt, 2007).

The literature on academic behavior has often ignored more specific academic relationships, such as studying together or academic helping networks. Previous studies have mostly focused on the role of friendships on academic behavior indicating that adolescents select friends based on similarity in academic achievement as well as that friends become more similar over time regarding academic achievement (Flashman, 2012; Gremmen, Dijkstra, Steglich, & Veenstra, 2017; Rambaran et al., 2017). Only recently, studies have investigated the interplay of studying and friendship networks (Gremmen et al., 2018; Palacios et al., 2019; Stadtfeld, Vörös, Elmer, Boda, & Raabe, 2019), suggesting that not only friendship but also studying networks can impact academic behavior by affecting students' learning interactions. However, this effect might vary depending on the access to academic help and resources and its diversity, for instance, being helped by a few or many classmates or by a specific group of peers (e.g., high-achievers). Indeed, students tend to perform academically better when they have a large number of helpers (Cadima et al., 2012), or if they 'hang out' with multiple peer groups (Nichols & White, 2001).

However, which characteristics are associated with being chosen as a preferred study partner over and above academic performance's similarity remains unknown. This study contributes to filling this gap by analyzing the extent to which adolescents' selection of preferred academic partners (*with whom would you like to study*) is driven by peers' academic performance, prosocial behavior, and friendships. Moreover, as high-achieving students would play an important role in academic settings, we analyze whether they are more likely to prefer to study with similar high-achieving peers and friends. To test these hypotheses, we used longitudinal social network analyses, that is, the stochastic actor-oriented models (Snijders, van de Bunt, & Steglich, 2010).

3.1.1 Characteristics of preferred study partners

Different motivations can be found behind individual decisions for selecting preferred studying partners. To advance personal interests such as academic success, adolescents may select studying

partners whose help they think will be useful (Larson et al., 2012; Sullivan et al., 2002). As a result, the behaviors and characteristics of others are evaluated in light of their contribution to the adolescents' goals. Hence, some adolescents might form relations that are useful for their educational success by preferring to study with high-achieving peers. These peers can provide resources that help adolescents boost or uphold their academic achievement (Dieterich, 2015) by, for example, helping them in gathering new information (Dokuka et al., 2015). As a result, high-achieving students tend to be more often selected as friends and preferred seat neighbors than other peers (Gremmen, van den Berg, Segers, & Cillessen, 2016; Laninga-Wijnen et al., 2017). Accordingly, we expected that adolescents would be more likely to nominate high-achievers as preferred academic partners (*hypothesis 1*).

However, although asking for academic help may intensify positive interpersonal contact with peers, at the same time, it might pose a threat to one's self-image (Ackerman & Kenrick, 2008) by showing one's weaknesses or the risk of being refused. As a consequence, adolescents might prefer to study with more approachable and friendly classmates, such as prosocial peers or friends. Prosocial behavior has been shown to impact individual social adjustment and academic achievement in children and early adolescents (Caprara et al., 2000; Chen et al., 2008). Adolescents tend to bond with prosocial peers in academic activities as the latter may produce enduring school environments that are conducive to academic learning. More broadly, prosocial adolescents tend to exhibit better peer relationships compared with their less prosocial peers (Eisenberg et al., 2006), as well as a high sense of belonging to the community (Young & Glasgow, 1998) and civic engagement (Luengo Kanacri et al., 2014).

Furthermore, aspects of prosocial behavior such as cooperativeness, helpfulness, sharing, willingness to help others, and being empathic are likely to promote positive and supportive academic interactions (Dijkstra, Lindenberg, & Veenstra, 2007; Gifford-Smith & Brownell, 2003). Consequently, we expected that adolescents would be more likely to nominate prosocial peers as preferred academic partners (*hypothesis 2*).

Adolescents also often turn to their friends for academic help and assistance (Azmitia et al., 2009). As friends experience similar challenges and care about each other's well-being (Buhrmester & Prager, 1995), friends are uniquely positioned to serve as academic resources. Increased communication and interaction among friends provide opportunities to learn and model a range of behaviors, including academic strategies and skills. Friends may provide adolescents with support and confidence facilitating school involvement (Berndt & Keefe, 1995). Moreover, friendship characteristics such as security and intimacy (Newcomb & Bagwell, 1995) create an environment in which help can be easily provided without fearing social repercussions (Hiatt et al., 2015).

Finally, due to the affection felt for friends, the time and effort invested in helping relationships such as studying together may be perceived as less costly and tiring (McGuire, 2003). Accordingly, we expected that adolescents would be more likely to nominate friends as preferred academic partners (*hypothesis 3*).

3.1.2 High achieving peers' choices in preferred study partners

High-achieving adolescents might be motivated to seek out similarly high-achieving peers to take advantage of their knowledge and abilities to help further their own academic success (Laninga-Wijnen et al., 2017). According to homophily theory, individuals prefer to befriend similar peers because, on average, those who are similar in behaviors, characteristics, and attitudes understand

each other better (McPherson et al., 2001). Befriending similar peers increase trustworthiness and predictability by enabling individuals to communicate with less effort and to share feelings of understanding (Byrne, 1971). As a result, relationships between similar people tend to be more rewarding, stable, with less conflict as well as a source of validation for development and reinforcement of social identity (Hallinan, 1980; Veenstra et al., 2013). As high-achieving students would share their focus and interest on academic success as well as exchange their academic knowledge and abilities to help their peers, we expected that high-achievers would be more likely to nominate other high-achievers as preferred academic partners (*hypothesis 4*).

Moreover, adolescents with high academic performance might be inclined to study with friends as they have already attained academic success. As a result, they can focus on attaining other social goals, such as having fun or establish intimate relationships. Consequently, we expected that high-achievers would be more likely to nominate friends as preferred academic partners (*hypothesis 5*). Furthermore, adolescents' preference to study with friends is likely to be associated with their academic performance. Adolescents might be inclined to prefer to study with high-achieving friends as the latter offer not only academic help but also intimate and close relationships. Friendships with high-achieving peers may produce benefits for academic achievement by motivating improvements in academic standards and performance, and by providing models for how to complete challenging academic tasks (Altermatt & Pomerantz, 2005; Gibbons et al., 2000). Accordingly, we expected that adolescents would be more likely to nominate high-achieving *friends* as preferred academic partners (*hypothesis 6*).

3.1.3 Present study

We aimed to assess whether the adolescents' selection of preferred academic partners is driven by peers' academic performance, prosocial behavior, and friendships. Moreover, we examined whether friends are more likely to prefer to study with one another when one of them is a high academic achiever. The present study provides insights into which characteristics are associated with preferred academic partners. We expected that adolescents would choose high-achievers (*hypothesis 1*), prosocial peers (*hypothesis 2*), and friends (*hypothesis 3*) as preferred academic partners. In addition, we expected that high-achievers would also choose high-achievers as preferred academic partners (*hypothesis 4*). Finally, we expected that preference to study with friends would be higher for adolescents who themselves or their friends exhibit higher academic performance (*hypothesis 5* and *hypothesis 6*, respectively). We examined our hypotheses using longitudinal social network analysis implemented in RSiena (Snijders et al., 2010), also controlling for students' socioeconomic status and sex as both variables are related to academic behavior (Crosnoe & Benner, 2015; Kretschmer et al., 2018; Sirin, 2005).

3.2 Method

3.2.1 Sample

We use data from the PROCIVICO-project, an intervention study aimed at increasing prosocial behavior and civic engagement among seventh-grade adolescents (for details see also Luengo Kanacri & Jiménez-Moya, 2017; Luengo Kanacri et al., 2019). The intervention is centered around the idea that prosocial behavior, as an exercise of active citizenship, can be taught and developed through appropriate formative experiences. Schools were randomly assigned to the intervention (nine classrooms from four schools) and control (seven classrooms from four schools) condition.

The intervention ran from May until November 2017. Assessments took place three times over the course of the study (April, November 2017, and May 2018).

To discard any effect of the intervention on the results, we conducted supplementary analyses comparing control and intervention classes. No significant differences were found regarding any variable related to the hypotheses of the study (see details in Appendix 3.A).

3.2.2 Procedure

During the survey, participants answered the questionnaires individually during regular school hours, while research assistants assisted participants when needed. Children were assured that their answers would be kept confidential and that they could stop participating at any time. The Institutional Review Board of the local university approved all the instruments and procedures to protect the confidentiality and rights of participants. Parental active consent and adolescents' assent were obtained for all participants included in the study.

3.2.3 Participants

The data were composed of 659 seventh graders from Santiago (Chile) from 16 classes ($M_{\text{age}}=12.3$; $SD=0.2$, 48% girls) from eight publicly and privately subsidized schools. According to the Chilean Ministry of Education, these schools are categorized as middle-low to middle socioeconomic status schools. The average classroom size was 41 students ($SD=8.1$). Three classes were excluded from the analyses. First, an only-boy class was excluded because processes regarding aggression and social norms may unfold differently in single-sex classes (Johnson & Gastic, 2014). Two classes were excluded because of high levels of missing data (above 20%). The final sample contained 537 students from 13 classes over three waves ($M_{\text{age}t1} = 12.3$; $SD_{\text{age}}= 0.2$, 52% girls). This study included both intervention and control classes in the analyses.

3.2.4 Measures

Academic preference networks (T1–T2–T3). Participants were to check on a roster and nominate up to three classmates who best fit the descriptor *with whom you would like to study*. Adjacency matrices were created for each classroom on each assessment, representing the different networks with nominations coded as 1 and non-nominations coded as 0.

Friendships (T1–T2). Participants were asked to check on a roster and nominate up to three classmates who best fit the descriptor *with whom do you hang out at school during recess* (Espelage, Holt, & Henkel, 2003; Schacter, White, Chang, & Juvonen, 2014).

Academic performance (T1–T2). Participant schools provided the general grade point average (GPA). The grades on Mathematics, Spanish, Sciences, History, and English were averaged as a composite measure of academic achievement. The Chilean grading scale ranges from 1 (poor) to 7 (excellent). GPA as a measure of academic performance has been widely used in the literature about peer selection processes (e.g., Flashman, 2012; Rambaran et al., 2017).

Prosocial behavior (T1–T2). Participants rated the frequency with which each of their classmates *helps those students in need* (from 1 = almost never to 5 = almost always). All the scores reported by all classmates about each student were aggregated, resulting in an individual score.

Socioeconomic status. SES was measured by parents' educational level, that is, their highest obtained educational degree. Parents' educational level was measured on a six-point scale, ranging from low (primary school) to high (obtained a postgraduate degree). Parents' educational level has

been suggested as the most reliable single indicator to evaluate the family's SES (Alexander et al., 1988).

Sex. Participants were asked about their sex, which was coded 0 for boys and 1 for girls.

3.2.5 Analytical strategy

Analyses were conducted using longitudinal multiplex social network models implemented in RSiena ('Simulation Investigation for Empirical Network Analysis'), which allows unraveling the development of academic networks over time (Ripley et al., 2018) while taking into account students' individual covariates (academic performance, prosocial behavior, socioeconomic status, and sex). RSiena models are actor-based models (Snijders et al., 2010), which assume that between assessments, actors (e.g., students) modify their relationships (e.g., academics relationships) based on their individual preferences.

At a given moment, students may change a friendship tie (i.e., creating a new tie, dropping one existing tie, or keeping the relationship unchanged) in response to the current state of the network structure and the attribute scores of both the actors and other students (see Ripley et al., 2018). The estimates of the model are obtained through an iterative simulation following a Markov Chain approach (Snijders et al., 2010), expressing the strength of the effects included in the model. These unstandardized estimates resemble regression coefficients in (logistic) regression indicating the importance of each effect (predictor variables) in creating or maintaining a tie.

Two models were estimated for testing the six hypotheses. Model 1 examined the hypotheses regarding the characteristics associated with preferred academic partners (*hypotheses 1 to 3*) as well as the preference of high-achievers to choose other higher-achievers as academic partners (*hypothesis 4*). Model 2 tested the two last hypotheses regarding the interaction between academic performance and friendship (*hypotheses 5 and 6*). The two models were estimated for each classroom separately using the Methods of Moments estimator and specifying 5000 iterations in phase 3 for calculating standard errors. The results of individual classes were combined in a meta-analysis using the Snijders-Baerveldt test (Snijders & Baerveldt, 2003), which makes inferences about parameters in the population of classes (from which the participant classes are considered to be a sample). The meta-analysis combined the analyzed parameter estimates across classrooms by testing the mean and variance of parameter values among classrooms.

To facilitate the interpretation of the results, we calculated the odds ratio of the parameter estimates. For instance, the odds ratio of 2 for reciprocity indicates that a participant is twice as likely to reciprocate a friendship than not to reciprocate, all else being equal. However, this assumption is strong, as parameters might correlate and co-occur. Therefore, the odds ratio (OR) reported in Table 3.3 should be interpreted with caution.

Missing data because of non-response were handled through the RSiena default missing data method (Ripley et al., 2018). Participants who joined and left the classroom network in-between time points were replaced by structural zeros, which specified the incoming and outgoing nominations at the moment that they were not present in the study. All models showed a good convergence of the algorithm (with overall maximum convergence ratios smaller than .15 for each model), and overall satisfactory goodness of fit (see details in Appendix 3.B).

3.2.6 Model specification and effect interpretation

Structural network effects were included to capture the basic tendencies of actors to form and maintain academic preference relationships. *Density* describes the tendency of actors to establish

relationships. *Reciprocity* is the tendency to reciprocate relationships (referring to forming mutual ties). The *transitive triplets* effect was included to measure the tendency of adolescents to prefer academic partners who also are chosen by their preferred academic partners (*transitivity*). The *indegree-popularity* and *outdegree-popularity* effects were included to represent the tendency of actors who already receive many nominations to receive more nominations over time and the tendency of actors to send who send many nominations to receive more nominations over time, respectively. Additionally, as some classes showed time heterogeneity (when parameters in the model are not constant in time), we added dummy variables for density and reciprocity representing that the formation and maintenance of ties might be different in period 2 (this period coincides with the summer break and the beginning of a new school year in Chile).

Regarding actor attributes, *ego*, *alter*, and *ego-alter* effects were included for academic performance and prosocial behavior. The *ego* and *alter* effects indicate that actors with higher scores on the covariate give and receive more nominations. The interaction *ego* \times *alter* indicates that actors with a higher value on the covariate prefer ties to others who also have a relatively high value on the covariate. *Friendship* was included in the model as a changing dyadic covariate (exogeneous network variable) to measure the effect of friendships on academic preference nominations (i.e., whether friends are chosen as preferred academic partners). Additionally, socioeconomic status and sex were included as control variables, by including the selection effects for the *same* sex and the *similarity* in socioeconomic status.

3.3 Results

3.3.1 Descriptive analysis

Academic preference networks. Table 3.1 presents a description of academic preference networks and longitudinal transitions between the three waves. The Jaccard index indicated moderate stability in academic preference ties between time points (around .25 in the first period and .22 in the second period). The highest turnover in academic preference ties occurred between waves 2 and 3, which corresponded with a summer break and the beginning of a new school year in Chile. Although the Jaccard index was relatively low in the present study, this had no consequences for the analyses, as all models showed good convergence statistics (below .25). Regarding the patterns of change in academic preference ties, a large proportion corresponds to dissolved and created ties and a smaller proportion to maintained ties. The average number of academic preference nominations was 2.52 in the first and second wave ($SD_{T1} = 0.36$; $SD_{T2} = 0.40$), decreasing to 2.32 in the third wave ($SD_{T3} = 0.35$).

Covariates. Table 3.2 presents descriptive information about covariates. At the first wave, the average educational level of the parents was 2.37 ($SD=1.02$), indicating that most parents completed a high-school education. Overall, academic performance, friendships, and prosocial behavior were stable across waves 1 and 2. On average, the academic performance of the students for the first wave was 5.02 ($SD=0.65$) and 5.13 for the second wave ($SD=0.61$), which is considered good in the Chilean grading system (between 5 and 5.9). The average prosocial behavior was 2.81 ($SD=1.12$) in the first wave and 2.89 in the second wave ($SD=1.08$), revealing that, on average, students sometimes *help those classmates in need*. Finally, the number of friendship nominations was 2.51 in the first and second wave ($SD_{T1} = 0.35$; $SD_{T2} = 0.37$).

Table 3.1 Description of academic preference networks per time point and periods

Class	Jaccard index		Hamming distance		Academic preference Av. Degree			Academic preference changes T1→T2			Academic preference changes T2→T3		
	T1- T2	T2- T3	T1- T2	T2- T3	T1	T2	T3	0→1	1→0	1→1	0→1	1→0	1→1
1A	.22	.19	116	145	2.47	2.82	2.90	76	58	38	77	75	35
1B	.25	.24	112	103	2.24	2.66	2.41	77	58	46	66	80	46
2B	.39	.31	60	46	2.88	2.77	2.20	34	34	44	30	45	33
2C	.30	.30	59	44	2.64	2.39	2.02	31	31	26	27	30	24
4A	.27	.20	92	88	2.75	2.73	2.46	52	53	38	55	64	29
4B	.21	.21	108	95	2.88	2.79	2.41	59	62	33	52	62	30
4C	.21	.24	98	86	2.71	2.77	2.32	53	51	33	41	55	31
5A	.20	.19	124	105	2.55	2.63	2.34	68	65	33	54	71	30
6B	.36	.33	90	77	2.99	3.00	2.40	45	45	51	39	49	44
7A	.27	.24	98	91	2.30	2.29	2.28	55	55	41	53	61	35
7B	.19	.16	128	107	2.60	2.37	2.39	71	81	36	80	77	30
7C	.23	.17	90	83	2.13	1.78	2.25	48	59	31	69	54	25
8A	.18	.11	64	80	1.67	1.72	1.82	48	47	22	53	56	14
Av.	.25	.22	95.3	88.5	2.52	2.52	2.32	55.2	53.8	36.3	53.5	59.9	31.2

Notes. Jaccard index refers to tie stability between observations; Hamming distance is the number of tie changes between observations; 0→1: Number of created ties; 1→0: Number of dissolved ties; 1→1: Number of maintained ties

3.3.2 Longitudinal social network analyses

Table 3.3 presents the results of the RSiena meta-analyses for the academic preference networks. The estimates and standard errors are based on the models estimated separately for the 13 classes, which were combined in a meta-analysis (Snijders & Baerveldt, 2003). We also reported the standard deviation of parameter estimates across classes (σ), and whether the standard deviation significantly differed from zero. Results on almost all the effects are very similar in Model 1 and Model 2. We reported in the text all the results of Model 1, except for the two interaction effects related to *hypotheses 5* and *6* (see Model 2 in Table 3.3).

A significant negative effect for the *density* was found (Est. = -1.15, $p < .001$, OR = 0.32), indicating that students were selective choosing preferred academic partners. Moreover, adolescents tended to reciprocate academic preference relations (Est. = 0.86, $p < .001$, OR = 2.35) and were likely to form triadic structures in which adolescents prefer academic partners who also are chosen by their academic partners (Est. = 0.29, $p < .001$, OR = 1.33). Students who send many academic preference nominations tended to receive fewer nominations over time (Est. = -0.19, $p < .001$, OR = 0.83). Furthermore, a significant *indegree-popularity* was found (Est. = 0.05, $p < .001$, OR = 1.05), indicating a tendency of students who already receive many nominations to receive more academic preference nominations over time. Also, adolescents selected same-gender peers as preferred academic partners (Est. = 0.40, $p < .001$, OR = 1.50). We found no tendency to nominate classmates with similar socioeconomic status as preferred academic partners (Est. = -0.03, $p = .84$, OR = 0.98).

Table 3.2 Descriptive of covariates for each class

Class	Type	N	% girls	SES				Friendship AvD		Academic Performance		Prosocial behavior	
				T1	T1	T2	T3	T1	T2	T1	T2	T1	T2
1A	INT	47	.44	3.00	.15	.14	.18	2.49	2.82	4.80	4.99	3.40	3.35
1B	INT	50	.49	2.98	.07	.05	.07	2.24	2.66	4.88	5.08	3.57	3.46
2B	INT	30	.50	1.60	.10	.06	.00	2.73	2.70	5.00	5.21	2.64	2.67
2C	INT	29	.48	1.54	.26	.18	.13	2.46	2.35	4.90	5.16	2.82	2.78
4A	INT	35	.47	2.10	.06	.03	.02	2.66	2.73	5.11	5.01	3.35	3.29
4B	INT	34	.50	2.45	.00	.05	.00	2.85	2.83	4.56	4.81	3.22	3.30
4C	INT	31	.39	2.24	.00	.00	.00	2.90	2.74	4.84	5.04	2.65	2.90
5A	CON	43	.58	2.26	.11	.11	.16	2.60	2.57	5.04	4.96	3.43	3.36
6B	CON	39	.68	2.91	.18	.18	.11	2.99	3.00	5.16	5.28	3.33	3.31
7A	CON	50	.50	2.12	.14	.14	.18	2.26	2.30	5.36	5.31	3.00	3.16
7B	CON	47	.38	1.88	.04	.04	.02	2.62	2.26	5.41	5.34	3.02	2.91
7C	CON	51	.64	2.50	.17	.13	.18	2.13	1.89	5.31	5.45	3.06	3.19
8A	CON	51	.68	2.33	.19	.20	.18	1.72	1.79	4.89	5.13	2.85	3.15
Av.	-	41.3	.52	2.30	.10	.13	.14	2.51	2.51	5.02	5.14	3.10	3.14

Notes. Type: Type of class (INT: Intervention class; CON: Control class); Friendship AvD: Friendship network average degree

We found significant *academic performance ego* and *alter* effects, indicating that students with higher academic performance sent fewer nominations (Est. = -0.17, $p < .001$, OR = 0.85) but received more nominations (Est. = 0.46, $p < .001$, OR = 1.58). The latter result is consistent with *hypothesis 1*, which is that high achieving peers are more likely to be chosen as study partners. Also, as expected, high-achievers tended to nominate other high-achievers as preferred academic partners (Est. = 0.17, $p = .01$, OR = 1.19) (*hypothesis 4*).

Regarding prosocial behavior, the findings were in line with *hypothesis 2*: prosocial peers were more nominated as preferred academic partners (Est. = 0.26, $p < .001$, OR = 1.29). No significant effects were found regarding prosocial peers nominating more classmates or other prosocial peers as preferred academic partners (Est. = -0.07, $p = .16$, OR = 0.93; Est. = 0.16, $p = .25$, OR = 1.18, respectively). Further, adolescents tended to choose friends as preferred academic partners (Est. = 0.33, $p < .001$, OR = 1.39), consistent with *hypothesis 3*.

Finally, we tested the interaction of students' academic performance and friendship in predicting academic preference relationships (Model 2 in Table 3.3). As expected, and conform *hypothesis 5*, we found that the effect of adolescents' selecting friends as academic partners was increased when those adolescents were high-achievers (Est. = 0.18, $p = .04$, OR = 1.19). However, there was no evidence that the effect of selecting friends as academic partners changed when those friends were high-achievers (Est. = -0.03, $p = .60$, OR = 0.97), not supporting *hypothesis 6*.

Table 3.3 Rsiena meta-analysis on academic preference networks (13 classes)

Effect	Est.	SE	σ	OR	Est.	SE	σ	OR	
Academic pref. networks		Model 1				Model 2			
Density	-1.15***	0.23	0.63**	0.32	-0.98***	0.27	0.74**	0.38	
Reciprocity	0.86***	0.08	0.00	2.35	0.82***	0.08	0.00	2.28	
Transitivity	0.29***	0.04	0.11*	1.33	0.28***	0.04	0.10*	1.33	
Indegree-popularity	0.05**	0.02	0.04**	1.05	0.05**	0.02	0.04**	1.05	
Outdegree-popularity	-0.19***	0.03	0.00	0.83	-0.18***	0.03	0.00	0.84	
Same-sex	0.40***	0.08	0.23**	1.50	0.39***	0.08	0.21**	1.48	
SES similarity	-0.03	0.12	0.00	0.98	-0.01	0.12	0.00	0.99	
Ac. perf. <i>alter</i>	0.46***	0.06	0.09	1.58	0.41**	0.12	0.19	1.51	
Ac. perf. <i>ego</i>	-0.17***	0.05	0.00	0.85	-0.08	0.09	0.00	0.93	
Ac. perf. <i>ego</i> \times <i>alter</i>	0.17**	0.07	0.08	1.19	0.18*	0.07	0.11	1.19	
Prosociality <i>alter</i>	0.26***	0.07	0.13	1.29	0.26***	0.07	0.13	1.30	
Prosociality <i>ego</i>	-0.07	0.05	0.00	0.93	-0.06	0.05	0.00	0.94	
Prosociality <i>ego</i> \times <i>alter</i>	0.16	0.14	0.34*	1.18	0.15	0.14	0.34*	1.16	
Friendship	0.33**	0.11	0.33***	1.39	0.42***	0.10	0.27***	1.53	
Ac. perf. <i>alter</i> \times Friendship	-	-	-	-	-0.03	0.06	0.00	0.97	
Ac. perf. <i>ego</i> \times Friendship	-	-	-	-	0.18***	0.09	0.00	1.19	
Dummy <i>ego</i>	0.04	0.06	0.09	1.04	0.04	0.06	0.08	1.04	
Dummy reciprocity	-0.16	0.21	0.56**	0.85	-0.16	0.21	0.57**	0.85	

Notes. *p < .05; **p < .01; ***p < .001; Est.: Estimate; SE: standard error; σ : across-classrooms standard deviation; OR: odds ratio; Ac. perf: Academic performance

3.4 Discussion

Academic behavior is strongly influenced by the social relations in which it is embedded. In contrast to the characteristics of students, teachers, and parents, there has been limited attention to academic relationships in the literature. This paper examined the extent to which the selection of preferred academic partners is driven by academic performance, prosocial behavior, and friendships. We investigated academic preference networks by asking adolescents to mention classmates *with whom they would like to study*.

We tested the extent to which academic performance, prosociality, and friendships are attractive characteristics of preferred study partners. First, we expected that adolescents would be more likely to nominate high-achievers as preferred academic partners. Our findings were consistent with this hypothesis, suggesting that adolescents are likely to prefer as study partners someone whom they can learn from. Second, we also expected that adolescents would be more likely to nominate prosocial peers and friends as preferred academic partners. Our findings were in line with these two hypotheses, indicating that adolescents prefer to study with more approachable, cooperative, and befriended classmates. Regarding prosociality, these results suggest that prosocial peers are attractive as academic partners because they might promote education environments that are conducive to academic learning, and also because they are perceived as empathic and willing to help others (Dijkstra et al., 2007; Gifford-Smith & Brownell, 2003). Regarding friendships, adolescents probably select friends as academic partners, because they not

only can provide access to valuable information, knowledge, and resources (Baldwin et al., 1997), but also are the persons with whom adolescents feel secure and connected, have fun and like to spend time with, and share personal issues (Hommel et al., 2012).

Furthermore, we tested hypotheses regarding the role of high-achieving peers in selecting preferred study partners. First, and as expected, high-achieving students chose similar peers as preferred academic partners. These results align with the idea that students prefer academic partners with similar academic interests and motivation that can help them to boost or maintain their academic success. Finally, we expected that high-achievers would be more likely to nominate friends as preferred academic partners and that adolescents would be more likely to nominate high-achieving friends as preferred academic partners. We only found support for the first hypothesis, suggesting that high achievers are inclined to study with friends as they have already attained academic success but also as they do not depend on others for their academic success. Together, the evidence that high-achievers tend to prefer similar peers and friends as academic partners might be related to high-achievers being more selective in their friendship and academic interactions than low-achievers. For instance, there is evidence showing that among college students, high-achievers form close and dense groups between each other, as well as avoid interactions with their low-achieving peers, a phenomenon known as the “rich-club” (Dokuka et al., 2015; Vaquero & Cebrian, 2013).

3.4.1 Limitations and Future directions

There are some limitations in the present study that should be acknowledged. First, adolescents might pursue different goals that impact their academic relationships. For example, whereas some adolescents may aim to reach academic success, others may be more inclined to pursue intimate relationships such as friendships or increase their status. Those diverse goals are likely to affect what characteristics adolescents find attractive for preferring academic partners. Accordingly, future research should include measures regarding academics or other relevant goals (e.g., affection and status). Along the same line, the extent to which certain behaviors and relationships are valued could depend on the classroom norms (Dijkstra & Gest, 2015). For example, in competitive settings that emphasize academic success (e.g., high-ability classrooms), adolescents tend to choose high-achievers and avoid deviant peers (i.e., those high in school misconduct) as academic partners (Palacios, Dijkstra, et al., 2019). Therefore, future studies can include measures of descriptive (what adolescents actually do), injunctive (what adolescents approve), or popularity norms (what behaviors are associated with popularity) to better understand the link between academic preference relationships and social norms.

3.5 Conclusion

This paper contributes to the field of adolescents' academic behavior by being the first to examine academic preference networks and its association with academic performance, prosocial behavior, and friendships. Academic preference networks can impact academic behavior by affecting students' learning interactions in schools and their access to and diversity of academic help. We focused on the characteristics associated with being chosen as a preferred study partner as well as the preferences of high-achieving students. We found that high-achievers, prosocial peers, and friends were more nominated as preferred academic partners. Furthermore, we found that high-achievers tend to choose other high-achievers and friends as preferred academic partners. These results indicate that motivations for choosing academic partners include not only academic success

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but also studying with supportive and close classmates. This study provides insights for teachers and school administrators on the importance of academic peer interactions in the classroom context.

Appendixes

Appendix 3.A

RSiena results comparing control and intervention classes

Table 3.A RSiena meta-analysis on academic preference networks comparing control and intervention classes

Effect	Est.	SE	<i>p</i>	Est. ^a	SE	<i>p</i>
<i>Acad. preference networks</i>	Control (n=6)			Intervention (n=7)		
Density	-0.99	0.42	.02	-0.16	0.54	.77
Reciprocity	0.86	0.13	< .001	-0.01	0.16	.94
Transitivity	0.28	0.07	< .001	0.02	0.09	.83
Indegree-popularity	0.08	0.02	< .001	-0.06	0.03	.03
Outdegree-popularity	-0.22	0.05	< .001	0.06	0.07	.38
Same-sex	0.24	0.11	.03	0.31	0.15	.05
SES similarity	-0.20	0.22	.36	0.25	0.27	.34
Academic perf. <i>alter</i>	0.37	0.10	< .001	0.15	0.13	.24
Academic perf. <i>ego</i>	-0.17	0.08	.02	0.01	0.09	.91
Academic perf. <i>ego</i> × <i>alter</i>	0.16	0.12	.19	0.02	0.15	.92
Prosociality <i>alter</i>	0.34	0.11	< .001	-0.13	0.14	.35
Prosociality <i>ego</i>	-0.15	0.08	.06	0.13	0.10	.22
Prosociality <i>ego</i> × <i>alter</i>	0.47	0.16	< .001	-0.57	0.21	.01
Friendship	0.37	0.16	.02	-0.06	0.22	.77
Dummy <i>ego</i>	0.12	0.08	.12	-0.15	0.11	.15
Dummy reciprocity	-0.37	0.32	.25	0.35	0.42	.40

Notes. ^a The estimates and standard errors in this model refer to the effect of the intervention on each parameter above the average value in the control group; Est.: Estimate; SE: standard error; *p*: p-value

Appendix 3.B
Goodness of fit

The fit of the models was assessed by examining the extent to which the models explained additional features of the academic preference networks that were not explicitly included in the model specification. We evaluated the distribution of outdegrees, indegrees, geodesic distance, and triad census. For the four statistics, most p -values were between .10 and .90, indicating a good fit. Regarding the outdegree distribution, the model slightly overrepresented the number of outgoing nominations with values of one and two and underestimated the outdegrees with a value of three. The cause of these results is probably that the number of nominations was limited up to the three.

