ARTICLE

The role of academic performance, prosocial behaviour and friendships on adolescents' preferred studying partners: A longitudinal social network analysis

Diego Palacios[1,2,3] | Christian Berger[4] |
Bernardette Paula Luengo Kanacri[4] | Mark Huisman[5] | René Veenstra[5]

[1]Society and Health Research Center, School of Psychology, Faculty of Social Sciences and Arts, Universidad Mayor, Santiago, Chile

[2]Millennium Nucleus for the Evaluation and Analysis of Drug Policies (nDP), Santiago, Chile

[3]Millennium Nucleus on Sociomedicine (SocioMed), Santiago, Chile

[4]School of Psychology, Pontificia Universidad Católica de Chile, Santiago, Chile

[5]University of Groningen, Groningen, The Netherlands

Correspondence
Diego Palacios, Society and Health Research Center, Faculty of Social Sciences and Arts, Universidad Mayor, Jose Toribio Medina 29, Santiago, Chile.
Email: diego.palacios@umayor.cl

René Veenstra, University of Groningen, Groningen, The Netherlands.
Email: d.r.veenstra@rug.nl

Abstract

Background: Peers constitute an important developmental context for adolescent academic behaviour providing support and resources to either promote or discourage attitudes and behaviours that contribute to school success. When looking for academic help, students may prefer specific partners based on their social goals regarding academic performance.

Aims: Based on the social goals for wanting to achieve academically (e.g., studying to be with friends, increasing/maintaining their own social status), we examine the extent to which adolescents' selection of preferred academic partners (*with whom they would like to study*) is driven by peers' academic performance, prosocial behaviour and friendships. Moreover, as high-achieving students play an important role in academic settings, whether they are more likely to prefer to study with similar high-achieving peers and friends was examined.

Sample: A total of 537 seventh-grade students from 13 classes over three waves.

Methods: Longitudinal social network analyses (RSiena).

Results: Adolescents were more likely to select high achievers, friends and prosocial peers as preferred academic partners. Furthermore, high achievers were more likely to choose other high achievers and friends as preferred academic partners.

Conclusions: Adolescents are likely to prefer as study partners someone they can learn from and who is more approachable, cooperative and friendly. Regarding high achievers,

they would choose not only academic partners with similar academic interests and motivations to help them boost their academic achievement but also classmates with whom they like to spend time and share personal issues.

INTRODUCTION

Adolescent academic behaviour is a key *determinant* of 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 schoolwork (Bissell-Havran & Loken, 2009; Demanet & van Houtte, 2012). Starting in early adolescence, peers take up a central role as sources of academic 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 behaviour (Chow et al., 2015; Rodkin & Ryan, 2012), providing support and resources that can promote or discourage attitudes and behaviours that contribute to school success, such as school involvement, motivation and disruptive classroom behaviour (Kindermann, 2007; Molloy et al., 2011).

Because of their proximity and direct interaction with classmates, peers have a unique perspective on classmates' academic behaviour, observing, for example, their grades and the speed and ease (or difficulty) with which classmates complete their assignments as well as the effort they put into assignments or the extent to which they give or receive help. Students often turn to their peers for help when they face challenges or difficulties (Ryan & Shin, 2011), as they provide valuable academic and social support (Altermatt, 2007). Help-seeking relationships are crucial as students gain awareness of academic difficulties and problem-solving strategies as well as learn who can help and how to ask for help (Newman, 2000).

There has been limited attention to the role of academic relationships, also called study partnerships. Previous peer studies have focused on the role of friendships on academic behaviour, indicating that adolescents select friends based on similarity in academic achievement and that friends become more similar over time regarding academic achievement (Flashman, 2012; Gremmen et al., 2017). Only recently, studies have investigated the interplay of studying and friendship networks (Gremmen et al., 2018; Palacios et al., 2019), suggesting that not only friendship but also studying networks can impact academic behaviour 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 a specific group of peers (e.g., high achievers). It has been found that students tend to perform better academically when they have many helpers (Cadima et al., 2012) or if they 'hang out' with multiple peer groups (Nichols & White, 2001).

However, the characteristics associated with being chosen as a study partner remain relatively unknown (exceptions are: Brouwer et al., 2022; Brouwer & Engels, 2021; Weber et al., 2020 for college students and Palacios et al., 2019; Palacios & Villalobos, 2016 for adolescents). In this paper, we focused on academic preferences (with whom would you study?) instead of academic ties (with whom do you study?). This distinction is important because the former type of tie involves a desire to study with someone but does not necessarily mean that a relationship occurs. Based on the work of Dowson and McInerney (2003) on the social reasons for wanting to achieve academically (e.g., studying to be with friends, raising or maintaining one's social status), we examined different characteristics of preferred academic partners. We examined the extent to which adolescents' selection of preferred academic partners

is driven by peers' academic performance, prosocial behaviour and friendships. Moreover, as high-achieving students play an important role in educational settings, we also examined whether they are more likely to prefer to study with similarly high-achieving peers and friends. To test these hypotheses, we used longitudinal social network analyses (Snijders et al., 2010).

Characteristics of preferred study partners

Different motivations underlie individual decisions to achieve academically and thus to choose preferred study partners. For example, academic achievement may be related to achieving/maintaining a social position in school (status goal) or establishing or maintaining interpersonal relationships (affiliation goal; Dowson & McInerney, 2003). Therefore, to achieve academic success, adolescents may choose study partners whose help they believe will be useful (Larson et al., 2012; Sullivan et al., 2002) in preparing for homework and exams (Hasan & Bagde, 2013). For example, some adolescents may form relationships that are helpful to their educational success by preferring to study with high-achieving peers who have the cognitive and other skills needed to perform well academically in school. These peers can provide resources that help adolescents increase or maintain their academic performance (Dieterich, 2015) by giving better advice or sharing more useful information in learning partnerships. Accordingly, we expected that adolescents would be more likely to identify high achievers as preferred academic partners (*hypothesis 1*).

Furthermore, social and recreational motives may also be important in preferring potential study partners. For instance, enhancing a sense of belonging to a peer group(s) and building or maintaining interpersonal relationships (affiliation goal). From this perspective, students would prefer to study together with classmates cooperatively (Dowson & McInerney, 2003). Accordingly, adolescents may prefer to study with more approachable and friendly classmates, such as prosocial peers and friends.

Prosocial behaviour refers to positive, voluntary behaviours such as giving, helping, cooperating, sharing and comforting that benefit others (Eisenberg et al., 2006). Prosocial behaviour can influence individual social adjustment and academic achievement in children and early adolescents (Caprara et al., 2000; Datu & Park, 2019). Prosocial adolescents show better social relationships in terms of reciprocal friendships and secure peer attachment (Eisenberg et al., 2006; Fabes et al., 1999) as well as academic achievement (e.g., Caprara et al., 2000; Luengo Kanacri et al., 2017). In addition, aspects such as cooperativeness, helpfulness, sharing, and empathy, as well as a high sense of community belonging (Young & Glasgow, 1998) and civic engagement (Luengo Kanacri et al., 2014), are likely to promote positive and supportive academic interactions with peers (Dijkstra et al., 2007; Gifford-Smith & Brownell, 2003). Arguably, adolescents who are known for their prosocial behaviour and who are therefore willing to help and cooperate with others will become the people to whom others turn for help (Borgatti & Cross, 2003). Consequently, we expected that adolescents would be more likely to nominate prosocial peers as preferred academic partners (*hypothesis 2*).

Adolescents may also turn to their friends for academic help and support (Azmitia et al., 2009). Friendships are a key developmental task of early adolescence (Sullivan, 1953) and fulfil critical social needs by providing adolescents with a sense of security, validation and emotional and instrumental support (Vitaro et al., 2009). Because friends experience similar challenges and care about each other's well-being (Buhrmester & Prager, 1995), they are uniquely positioned to serve as academic resources. Increased communication and interaction among friends provide opportunities to learn and model various behaviours, including academic strategies and skills.

Friends can provide support and confidence to adolescents, thereby facilitating school engagement (Glick & Rose, 2011). In addition, friendship characteristics such as security and intimacy (Newcomb & Bagwell, 1995; Ng-Knight et al., 2019) create an environment in which academic help can be readily provided without fear of social repercussions (Hiatt et al., 2015) or mitigate the social costs associated with help avoidance (Ackerman & Kenrick, 2008). Finally, because of affection for friends, the time and effort invested in helping relationships, such as studying together, may be perceived as less costly and

exhausting (McGuire, 2003). Accordingly, we expected that adolescents would be more likely to identify friends as preferred academic partners (*hypothesis 3*).

In addition, adolescents may pursue academic success to combine the realization of different social goals (e.g., recognition and affiliation). For example, adolescents may prefer to study with high-achieving friends because they provide academic help and intimate and close relationships. Friendships with high-achieving peers would produce academic benefits by motivating improvements in academic standards and performance and by providing models of how to complete challenging academic tasks (Altermatt & Pomerantz, 2005; Gibbons et al., 2000) in a more friendly and less stressful context. Accordingly, we expected that adolescents would be more likely to nominate high-achieving friends as preferred academic partners (*hypothesis 4*).

High-achieving peers' choices in preferred study partners

The social goals of belonging to one or more peer groups and building interpersonal relationships can also be applied to high-achieving peers. For example, they may be motivated to seek out other high-achieving peers in order to use their knowledge and skills to further their academic success. Having relationships with similar peers increases trustworthiness and predictability by allowing individuals to communicate with less effort and share feelings of understanding (McPherson et al., 2001). As a result, these relationships tend to be more rewarding, stable and conflict-free (Laursen & Veenstra, 2021). Because high-achieving students share a focus and interest in academic success and share their academic knowledge and skills to help their peers, we expected that high-achieving students would be more likely to nominate other high-achieving students as preferred academic partners (*hypothesis 5*).

In addition, adolescents with high academic achievement may be inclined to study with friends because they have already achieved academic success. This allows them to focus on achieving their social goals, such as having fun or forming intimate relationships (affiliation goal). Consequently, we expected that high achievers would be more likely than low achievers to nominate friends as preferred academic partners (*hypothesis 6*).

The present study

We examined whether adolescents' selection of preferred academic partners is driven by peers' academic performance, prosocial behaviour and friendships. We also examined whether high-achieving adolescents were more likely to prefer to study with each other and with friends. We expected that adolescents would choose high achievers (*hypothesis 1*), prosocial peers (*hypothesis 2*) and friends (*hypothesis 3*) as their preferred academic partners. In addition, we expected that the preference to study with friends would be higher for high achievers (*hypothesis 4*). Finally, we expected that high achievers would also prefer high achievers and friends as academic partners (*Hypotheses 5* and *6*, respectively). We tested our hypotheses using longitudinal social network analysis implemented in *RSiena* 1.3.23 version (Snijders et al., 2010), controlling for parents' educational level and gender, as both variables are related to academic behaviour (Kretschmer et al., 2018; Sirin, 2005).

METHODS

Procedure

We use data from the PROCIVICO project, an intervention study aimed at increasing prosocial behaviour and civic engagement among seventh-grade adolescents (for details, see Luengo Kanacri & Jiménez-Moya, 2017). The intervention is based on the idea that prosocial behaviour, as an exercise in

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) conditions. The intervention ran from May to November 2017. Assessments took place four times (i.e., waves) throughout the study (April and November 2017; May and December 2018). Due to high levels of missing data at T4, we used data from T1 to T3. We also compared control and intervention classrooms to discard any intervention effect on the results. We found a significant difference only for high achievers being more preferred as academic partners (see Table A1 in Appendix A).

During the survey, participants completed the questionnaires individually during regular school hours, with research assistants assisting participants as needed. Children were assured that their responses would be kept confidential and that they could stop participating at any time. The Institutional Review Board of the local university approved all instruments and procedures to protect the confidentiality and rights of participants. Active parental consent and adolescent assent were obtained for all participants included in the study.

Participants

The data were collected from 659 seventh graders from Santiago, Chile, in 16 classrooms (M_{age} = 12.3; SD = .2, 48% girls) from eight public and private subsidized schools. According to the Chilean Ministry of Education, these schools are categorized as middle-low to middle socioeconomic status. The average class size was 41 students (SD = 8.1). Three classrooms were excluded from the analyses. First, an all-male classroom was excluded because processes related to aggression and social norms may play out differently in single-gender classrooms (Johnson & Gastic, 2014). Two classrooms were excluded because of high levels of missing data (>20%). The final sample contained 537 students from 13 classrooms over three waves (M_{age} t1 = 12.3; SD_{age} = .2, 52% girls). This study included both intervention and control classrooms in the analyses. Chilean students usually remain with their classmates across elementary education (first through eighth grades). Despite this particularity, research on adolescent peer relations, such as friendships and rejection with Chilean samples, has shown similar patterns compared with American and European populations (Berger et al., 2011, 2016).

Measures

Academic preference networks (T1–T2–T3)

Participants were to check on a roster and nominate between zero and three classmates who best fit the descriptor *with whom you would like to study*. Adjacency matrices were created for each classroom at 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 you hang out at school during recess* (Espelage et al., 2003; Schacter et al., 2014).

Academic performance (T1–T2)

Participating schools provided the general grade point average (GPA). Grades in mathematics, Spanish, sciences, history and English were averaged as a composite measure of academic achievement. Chilean

middle school students tend to take all subjects with the same classmates. The Chilean grading scale ranges from 1 (poor) to 7 (excellent), with a cutoff score of 4. 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 behaviour (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). The scores reported by all classmates for each student were aggregated, resulting in an individual score reflecting each student's reputation for helping behaviour.

Parents' educational level

This was measured by the highest obtained educational degree of parents, ranging from low (1: primary school) to high (6: postgraduate degree).

Gender

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

Analytical strategy

Analyses were conducted using longitudinal social network models implemented in RSiena ('Simulation Investigation for Empirical Network Analysis'), which allows for unravelling the development of academic networks over time (Ripley et al., 2018) while accounting for students' individual covariates (academic performance, prosocial behaviour, parents' education level and gender). RSiena models are actor-based models (Snijders et al., 2010), which assume that actors (e.g., students) change their relationships (e.g., academic relationships) between assessments based on their individual preferences and network position as well as the network structure. At any given moment, students may modify their friendship ties (i.e., create a new tie, drop an existing tie, or leave the relationship unchanged) in response to the current state of the network structure and the attribute scores of both actors and other students (see Ripley et al., 2018). Estimates of the model are obtained through an iterative simulation following a Markov chain approach (Snijders et al., 2010) and express the strength of the effects included in the model. These unstandardized estimates are similar to regression coefficients in (logistic) regression and indicate the importance of each effect (predictor) in creating or maintaining a tie.

Two models were estimated to test the six hypotheses. Model 1 tested the hypotheses regarding the characteristics associated with preferred academic partners (*Hypotheses 1–3*) as well as the preference of high achievers to choose other high achievers as academic partners (*hypothesis 5*). Model 2 tested the two hypotheses regarding the interaction between academic achievement and friendship (*Hypotheses 4 and 6*). The two models were estimated separately for each classroom using the Methods of Moments estimator with 5000 iterations specified in Phase 3 for calculating standard errors. The results of individual classrooms were combined in a meta-analysis using the Snijders-Baerveldt test (Snijders & Baerveldt, 2003), which allows inferences about parameters in the population of classrooms (from which the participating classrooms are a sample).

Missing data due to non-response were handled using the RSiena default missing data method (Ripley et al., 2018). Participants who joined and left the classroom network between time points were replaced with structural zeros, indicating the incoming and outgoing nominations if they were not present in the

study. All models showed good algorithm convergence (with overall maximum convergence ratios less than .15 for each model) and overall satisfactory goodness of fit for the outdegree, indegree, geodesic distance and triad census distributions.

Model specification and effect interpretation

Structural network effects were included to capture the basic tendencies of actors to form and maintain academic preference relationships (Snijders et al., 2010). *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 are also 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 who send many nominations to receive more nominations over time, respectively. Additionally, as some classrooms showed time heterogeneity (when the parameters in the model are not constant between assessments), we added dummy variables for density and reciprocity to represent that the formation and maintenance of ties might differ 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 behaviour. The *ego* and *alter* effects indicate that actors with higher scores on the covariate give and receive more nominations. The interaction *ego × alter* indicates that actors with a higher value on the covariate prefer ties to others with a high value on the covariate. *Friendship* was included in the model as a changing dyadic covariate (exogenous network variable) to measure the effect of friendships on academic preference nominations (i.e., whether friends are chosen as preferred academic partners). Moreover, parents' education level and gender were included as control variables by including the selection effects for the *same* gender and the *similarity* in parents' education levels. We used the RSiena default procedure for centring. Means were subtracted for individual (e.g., academic performance) and dyadic (e.g., friendships) covariates.

Additionally, we constructed an ego-alter selection plot (Figure 1) to understand the selection effects related to academic performance (*ego*, *alter* and *ego × alter* effects) by considering them all simultaneously (Ripley et al., 2018). Figure 1 presents the log odds for the academic preference networks based on different academic performance levels (ranging from 4 (low) to 7 (excellent)). The higher the value in the selection function (*y*-axis), the higher the probability of an academic preference tie between students.

RESULTS

Descriptive analysis

Academic preference networks

Table 1 describes 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 and .22 in the second period). The highest turnover in academic preference ties occurred between waves 2 and 3, corresponding to the summer break and the beginning of a new school year in Chile. Although the Jaccard index was relatively low in the present study, this did not affect 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
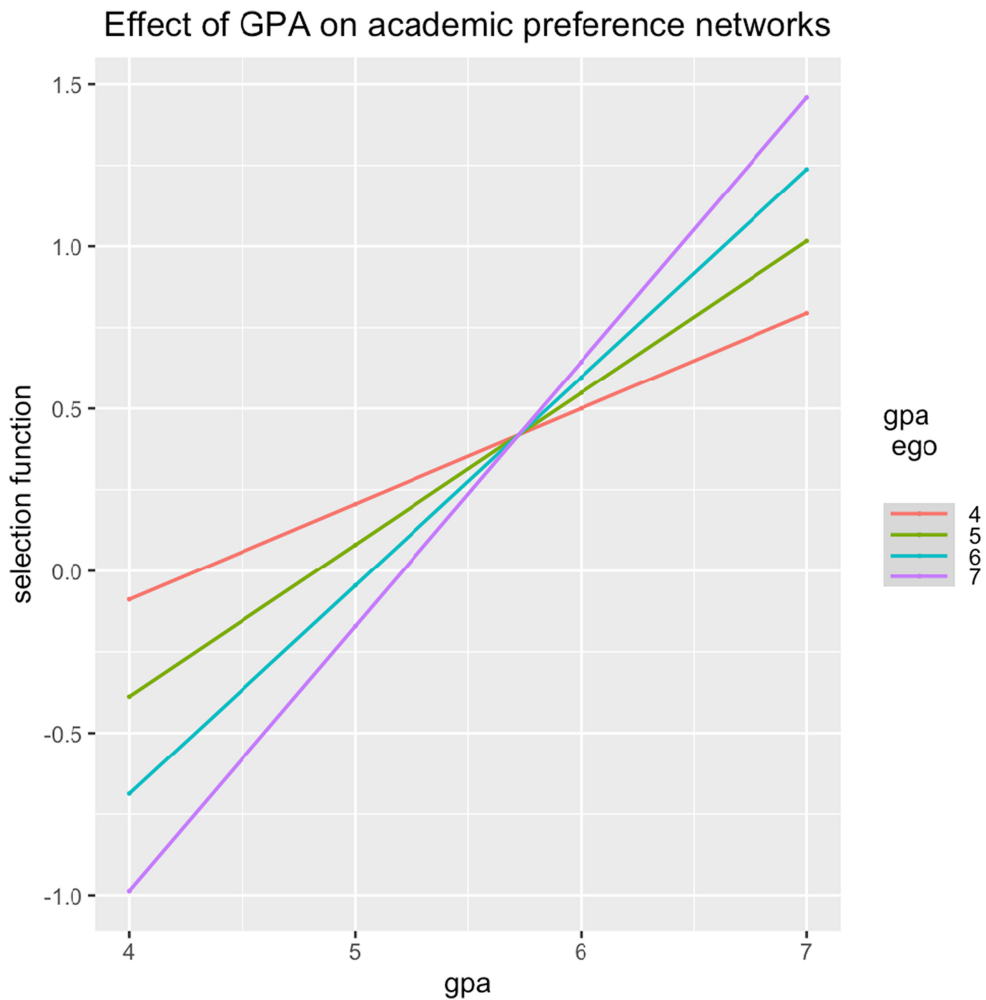
FIGURE 1 Selection plot for academic preference networks based on academic performance levels *Note*: The values of this plot are based on a representative classroom, that is, one in which the values of *ego, alter* and *alter x ego* estimated effects are close to those in the meta-analysis. The academic performance (GPA) levels refer to sufficient (4), acceptable (5), good (6) and excellent (7) in the Chilean education system.

was 2.52 in the first and second waves (SD_{T1} = .36; SD_{T2} = .40), decreasing to 2.32 in the third wave (SD_{T3} = .35). Academic preference and friendship ties showed moderate overlap across classrooms (.35 in wave 1 in wave 2, and .28 in wave 3).

Covariates

Table 2 presents descriptive information about covariates. In the first wave, the average educational level of the parents was 2.37 (SD = 1.02), indicating that most parents had completed high school. Overall, academic performance, friendships and prosocial behaviour were stable across waves 1 and 2. On average, students' academic performance for the first wave was 5.02 (SD = .65) and 5.13 for the second wave (SD = .61), which is considered acceptable in the Chilean grading system (between 5 and 5.9). In the Chilean grading system, the grades are continuous from 1 to 7, and the threshold for passing is 4.

TABLE 1 Description of the academic preference networks by time point and period between the twotime points.

Class	Jaccard Index		Hamming distance		Academic preference Av. degree			Academic preference, Changes T1→T2			Academic preference, Changes T2→T3			Academic preference and friendship ties overlapping		
	T1–T2	T2–T3	T1–T2	T2–T3	T1	T2	T3	0→1	1→0	1→1	0→1	1→0	1→1	T1	T2	T3
1A	.22	.19	116	145	2.47	2.82	2.90	76	58	38	77	75	35	.30	.27	.19
1B	.25	.24	112	103	2.24	2.66	2.41	77	58	46	66	80	46	.32	.34	.36
2B	.39	.31	60	46	2.88	2.77	2.20	34	34	44	30	45	33	.46	.51	.47
2C	.30	.30	59	44	2.64	2.39	2.02	31	31	26	27	30	24	.49	.64	.41
4A	.27	.20	92	88	2.75	2.73	2.46	52	53	38	55	64	29	.38	.39	.25
4B	.21	.21	108	95	2.88	2.79	2.41	59	62	33	52	62	30	.29	.21	.19
4C	.21	.24	98	86	2.71	2.77	2.32	53	51	33	41	55	31	.29	.35	.33
5A	.20	.19	124	105	2.55	2.63	2.34	68	65	33	54	71	30	.22	.27	.23
6B	.36	.33	90	77	2.99	3.00	2.40	45	45	51	39	49	44	.42	.32	.27
7A	.27	.24	98	91	2.30	2.29	2.28	55	55	41	53	61	35	.44	.47	.26
7B	.19	.16	128	107	2.60	2.37	2.39	71	81	36	80	77	30	.43	.31	.24
7C	.23	.17	90	83	2.13	1.78	2.25	48	59	31	69	54	25	.36	.31	.24
8A	.18	.11	64	80	1.67	1.72	1.82	48	47	22	53	56	14	.18	.21	.24
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	.35	.35	.28

Note: Jaccard index refers to the tie changes between observations; Hamming distance is the number of tie changes between observations.

TABLE 2 Descriptives of the covariates per classroom.

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

Abbreviations: N, the total number of students considering the three measurement times; pEd, Parents education level.

The average prosocial behaviour was 2.81 ($SD = 1.12$) in the first wave and 2.89 in the second wave ($SD = 1.08$), indicating that students, on average, sometimes *help those classmates in need*. Finally, friendship nominations were 2.51 in the first and second waves ($SD_{T1} = .35$; $SD_{T2} = .37$).

Longitudinal social network analyses

Table 3 presents the results of the RSiena meta-analyses for the academic preference networks. The estimates and standard errors are based on separate models for the 13 classrooms, which were later combined in a meta-analysis (Snijders & Baerveldt, 2003). We also reported the estimated between-classroom standard deviation (σ) and whether the standard deviation significantly differed from zero. The results on almost all the effects are very similar in Model 1 and Model 2. We reported all results from Model 1 in the text, except for the two interaction effects related to *hypotheses 5* and *6* (see Model 2 in Table 3).

A significant negative effect for the *density* was found (Est. = −1.43, $p < .001$), indicating that students were selective in choosing preferred academic partners. Moreover, adolescents tended to reciprocate academic preference relationships (*reciprocity* Est. = .88, $p < .001$) and to prefer academic partners who were also chosen by their academic partners (*transitivity* Est. = .29, $p < .001$). Students who sent many academic preference nominations tended to receive fewer nominations (*outdegree-popularity* Est. = −.19, $p < .001$), and students who already received many nominations received more academic preference nominations over time (*indegree-popularity* Est. = .05, $p < .01$). Also, adolescents

TABLE 3 RSiena meta-analysis of academic preference networks (13 classrooms).

Effect	Est.	SE	σ	Est.	SE	σ
	Model 1			Model 2		
Academic preference networks						
Density	−1.43***	.14	.23	−1.27***	.21	.74*
Reciprocity	.87***	.08	.00	.83***	.08	.00
Transitivity	.29***	.04	.11**	.28***	.04	.10*
Indegree-popularity	.05**	.02	.04**	.05**	.02	.04**
Outdegree-popularity	−.18***	.03	.00	−.18***	.03	.00
Same gender	.43***	.06	.15*	.42***	.06	.21
Parents education similarity	−.01	.12	.00	.01	.12	.00
Academic performance *alter* (H1)	.45***	.06	.10	.41***	.12	.19
Academic performance *ego*	−.17***	.05	.00	−.08	.09	.00
Academic performance *ego* × *alter* (H5)	.17**	.07	.07	.18*	.07	.11
Prosocial behaviour *alter* (H2)	.26***	.07	.13	.26***	.07	.13
Prosocial behaviour *ego*	−.07	.05	.00	−.06	.05	.00
Prosocial behaviour *ego* × *alter*	.16	.14	.34*	.15	.14	.34*
Friendship (H3)	.21**	.08	.26***	.29***	.08	.27***
Academic performance *alter* × Friendship (H4)	–	–	–	−.02	.06	.00
Academic performance *ego* × Friendship (H6)	–	–	–	.18*	.09	.00
Dummy *ego*	.04	.06	.09	.04	.06	.08
Dummy reciprocity	−.16	.20	.53**	−.16	.21	.57**

Abbreviations: Est., estimate; *SE*, standard error; σ, estimated between-classroom standard deviation.

*$p < .05$; **$p < .01$; ***$p < .001$.

selected *same-gender* peers (Est. = .43, p < .001) but not peers with similar parental education level as preferred academic partners (Est. = −.01, p = .99).

We found significant *academic performance ego* and *alter* effects, indicating that students with higher academic performance sent fewer nominations (Est. = −.17, p < .001) but received more nominations (Est. = .45, p < .001) than non-high achievers. Also, as expected, high achievers tended to nominate other high achievers as their preferred academic partners (academic performance ego × alter Est. = .17, p = .01; *hypothesis 5*). These results indicated that those students are placed in a central position by being more attractive as study partners (consistent with *hypothesis 1*), but at the same time, are more selective in their nominations by mainly preferring other high achievers as preferred study partners (supporting *hypothesis 5*). Moreover, the ego-alter selection plot (Figure 1) illustrates these findings by showing that adolescents strongly prefer high-achieving peers as study partners regardless of their academic performance. Conversely, poor academic performers were avoided as study partners, particularly by high achievers. Interestingly, this plot showed that high achievers had a greater variation in their study partner preferences than other academic achievement groups, with a stronger preference for other high achievers and the most negative preference for low achievers. Regarding prosocial behaviour, the findings aligned with *hypothesis 2*: prosocial peers were more nominated as preferred academic partners (*prosocial behaviour alter* Est. = .26, p < .001). No significant effects were found for prosocial peers nominating more classmates or other prosocial peers as preferred academic partners (*prosocial behaviour ego* Est. = −.07, p = .19; *prosocial behaviour ego × alter* Est. = .16, p = .25, respectively). Furthermore, adolescents chose friends as their preferred academic partners (*friendship* Est. = .21, p < .01), 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). As expected, and supporting *hypothesis 6*, we found a significant positive effect of the interaction between *academic performance ego* and *friendships* (Est. = .18, p = .04). This means that when ego has a higher performance, the effect of friendships between ego and alter is greater on ego's choice of alter as a preferred study partner. Finally, the hypothesis that adolescents are more likely to choose friends with high academic performance as academic partners did not find support (Est. = −.02, p = .70; *hypothesis 4*).

DISCUSSION

Successful school adjustment depends not only on academic aspects but also on social aspects. Adolescents may have different social goals that affect their academic relationships. When seeking academic help, students may prefer certain partners. This study focused on how peers' academic performance, prosocial behaviour and friendships affect preferences for academic partners. In addition, we focused on the academic partner preferences of high-achieving students.

First, as expected, adolescents were more likely to prefer high achievers as academic partners, suggesting that they may prefer to study with someone they can learn from. High-achieving students may help their partners with challenging study material and exam preparation (Dieterich, 2015), which may help to improve their academic performance. In this direction, there is evidence that high achievers are more often chosen as preferred seat neighbours (Gremmen et al., 2016). Choosing high achievers as study partners could be beneficial for adolescents in order to comply with academic rules and obligations (recognition goal) and/or to achieve/maintain a social position in school (status goal).

Second, we expected that adolescents would be more likely to nominate prosocial peers and friends as preferred study partners. Choosing prosocial classmates or friends as study partners could be instrumental in increasing adolescents' affiliation with a group and in forming or maintaining interpersonal relationships (affiliation goal). Our findings were consistent with these hypotheses, suggesting that adolescents value forming and maintaining positive and close interactions based on mutual support (Kiefer & Ryan, 2011). These interactions are more likely to occur with more approachable and cooperative peers (Dowson & McInerney, 2003).

In terms of prosocial behaviour, the findings suggest that prosocial peers are attractive as academic partners because they foster a supportive educational environment and are perceived as empathetic and willing to help others (Dijkstra et al., 2007; Gifford-Smith & Brownell, 2003). Our findings are consistent with positive evaluations of prosocial peers, as indicated by their positive association with acceptance and popularity (LaFontana & Cillessen, 2002; Peters et al., 2010).

Regarding friendships, adolescents may choose friends as academic partners because the latter can provide access to valuable academic information, knowledge and resources (Baldwin et al., 1997), but also because they are the people with whom adolescents feel safe and connected, share personal problems and enjoy having fun and spending time (Hommes et al., 2012). This finding is consistent with friendship being an important precursor to student collaboration (Stadtfeld et al., 2019).

We also tested hypotheses regarding the role of high-achieving peers in selecting preferred study partners. As expected, high-achieving students chose other high-achieving students as their preferred academic partners. High-achieving students may be motivated to seek out other high-achieving friends in order to use their knowledge and skills to further their own goals and interests. Conversely, high-achieving students may not find low-achieving students to be attractive academic partners because the former do not receive enough academic resources from them (Hartl et al., 2015). These findings may support that students prefer academic partners not only with similar academic interests and motivation who can help them increase or maintain their academic success but also with a desire to belong to a group and work well academically with them (affiliation goal; McInerney & Ali, 2006).

We also found support for the hypothesis that high achievers would be more likely to nominate friends as preferred academic partners. This finding suggests that high achievers may be more inclined to study with friends because they have already achieved academic success and, consequently, are not dependent on others for their academic success. Conversely, low achievers in this study gave more recommendations than they received. This can be seen as a form of academic peer rejection (Rambaran et al., 2017), referred to as a default selection process (Deptula & Cohen, 2004; Sijtsema et al., 2010). This process refers to their limited pool of academic interactions and thus the difficulties they face in navigating to a better academic position (Nowicki, 2003). Furthermore, although our findings suggest that study relationships also emerge among peers with complementary characteristics (e.g., low achievers prefer high achievers), the most pronounced effect is found among high-achieving adolescents. This finding suggests that adolescents are selective when it comes to helping relationships (Kuhlmeier et al., 2014; van Rijsewijk et al., 2016), which may lead to a Matthew effect (Merton, 1968; Rigney, 2010) in which high achievers accumulate more academic nominations over time.

There are some limitations to the present study that should be acknowledged. First, the networks studied were about preferences to study with someone, but it may be that some of these preferences were not realized. Future research could collect information on whether some adolescents maintain their grades on their own or actually study with others. Second, we did not directly measure the different social and academic goals that influence adolescents' academic behaviours (e.g., Liem, 2016). Future studies can measure and compare the association between different academic or social goals and study partner characteristics. Third, the extent to which certain behaviours and relationships are valued may depend on classroom norms (Dijkstra & Gest, 2015). For example, in competitive environments that value academic success (e.g., high-ability classrooms), adolescents tend to choose high achievers as study partners and avoid deviant peers (i.e., those with high levels of school misbehaviour; Palacios et al., 2019). Therefore, future studies can include measures of descriptive (what adolescents actually do), injunctive (what adolescents endorse) or popularity norms (what behaviours are associated with popularity) to better understand the link between academic preference relationships and social norms (Veenstra & Lodder, 2022). Finally, the maximum number of nominations of three may artificially limit the choice of preferred academic partners. However, in previous studies, the average number of academic partner nominations was around three or less (Dokuka et al., 2020; Palacios et al., 2019; Stadtfeld et al., 2019; Van Rijsewijk et al., 2020).

Future work could examine the coevolution of academic preference networks with other networks, such as friendship, to answer questions about the effect of friendship reciprocity, as well as the

association between the number of friends and the number of study partners, or whether being friends with friends increases the likelihood of becoming a study partner.

In addition, future research can take advantage of the fine-grained mechanisms proposed by Snijders and Lomi (2019) to study ties based on the similarity of sender and receiver attributes: aspiration refers to the tendency to send more ties to individuals with high values; attachment conformity involves having more ties to others whose attribute values are close to the 'social norm'; and sociability implies that individuals with higher attribute values generally form more ties. Finally, future research can examine whether academic networks vary across subjects (in this study, we combined grades for math, Spanish, science, history and English), whether there are trade-offs (e.g., will you help me with math if I help you with Spanish?) or whether the academic help received is focused on improving one's understanding or mastery (adaptative help-seeking) or accelerating a practical and convenient solution to a problem without engaging in the learning process (expedient help-seeking) (Nelson-Le Gall, 1981).

Our findings indicate that motivations for choosing academic partners include academic success and studying with prosocial and close classmates. These findings are consistent with the idea that adolescents choose academically engaged and cooperative peers as academic helpers (Kilday & Ryan, 2023), even if they are not friends (Hoffman et al., 2020; van Rijsewijk et al., 2020). As for high achievers, they would choose not only academic partners with similar academic interests and motivations to help them improve their academic performance, but also classmates with whom they enjoy spending time and sharing personal problems. Therefore, academic preference networks may influence academic behaviour by influencing students' learning interactions in school and their access to a variety of academic help.

This study provides insights for teachers and school administrators about the importance of academic peer interactions in the classroom and for practitioners and policymakers to design educational interventions that promote academic and prosocial skills and friendships in the classroom to improve academic learning. This could have implications for seating arrangements that take into account students' preferences for learning and academic collaboration with others (e.g., group projects).

AUTHOR CONTRIBUTIONS
Diego Palacios: Conceptualization; formal analysis; funding acquisition; investigation; writing – original draft; writing – review and editing. **Christian Berger:** Conceptualization; funding acquisition; writing – review and editing. **Bernardette Paula Luengo Kanacri:** Data curation; funding acquisition; writing – review and editing. **Mark Huisman:** Supervision; writing – review and editing. **René Veenstra:** Conceptualization; supervision; writing – review and editing.

CONFLICT OF INTEREST STATEMENT
None declared.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Diego Palacios https://orcid.org/0000-0001-6840-0068

REFERENCES

Ackerman, J. M., & Kenrick, D. T. (2008). The costs of benefits: Help-refusals highlight key trade-offs of social life. *Personality and Social Psychology Review*, *12*(2), 118–140. https://doi.org/10.1177/1088868308315700

Altermatt, E. R. (2007). Coping with academic failure. *The Journal of Early Adolescence*, *27*(4), 479–508. https://doi.org/10.1177/0272431607302938

Altermatt, E. R., & Pomerantz, E. M. (2003). The development of competence-related and motivational beliefs: An investigation of similarity and influence among friends. *Journal of Educational Psychology*, *95*(1), 111–123. https://doi.org/10.1037/0022-0663.95.1.111

Altermatt, E. R., & Pomerantz, E. M. (2005). The implications of having high-achieving versus low-achieving friends: A longitudinal analysis. *Social Development*, *14*(1), 61–81. https://doi.org/10.1111/j.1467-9507.2005.00291.x

Azmitia, M., Cooper, C. R., & Brown, J. R. (2009). Support and guidance from families, friends, and teachers in Latino early Adolescents' math pathways. *The Journal of Early Adolescence*, *29*(1), 142–169. https://doi.org/10.1177/0272431608324476

Baldwin, T. T., Bedell, M. D., & Johnson, J. L. (1997). The social fabric of a team-based M.B.A. Program: Network effects on student satisfaction and performance. *Academy of Management Journal*, *40*(6), 1369–1397. https://doi.org/10.2307/257037

Berger, C., Lisboa, C., Cuadros, O., & de Tezanos-Pinto, P. (2016). Adolescent peer relations and socioemotional development in Latin America: Translating international theory into local research. *New Directions for Child and Adolescent Development*, *2016*(152), 45–58. https://doi.org/10.1002/cad.20161

Berger, C., Rodkin, P., & Dijkstra, J. K. (2011). Antipathetic relationships among adolescents: Exploring prevalence, gender differences, and stability in the United States and Chile. *Anales de Psicología/Annals of Psychology*, *27*, 783–790. https://revistas.um.es/analesps/article/view/135411

Bissell-Havran, J. M., & Loken, E. (2009). The role of friends in early Adolescents' academic self-competence and intrinsic value for math and English. *Journal of Youth and Adolescence*, *38*(1), 41–50. https://doi.org/10.1007/s10964-007-9266-3

Borgatti, S. P., & Cross, R. (2003). A relational view of information seeking and learning in social networks. *Management Science*, *49*(4), 432–445. https://doi.org/10.1287/mnsc.49.4.432.14428

Brouwer, J., de Matos Fernandes, C. A., Steglich, C. E. G., Jansen, E. P. W. A., Hofman, W. H. A., & Flache, A. (2022). The development of peer networks and academic performance in learning communities in higher education. *Learning and Instruction*, *80*, 101603. https://doi.org/10.1016/j.learninstruc.2022.101603

Brouwer, J., & Engels, M. C. (2021). The role of prosocial attitudes and academic achievement in peer networks in higher education. *European Journal of Psychology of Education*, *1–18*, 567–584. https://doi.org/10.1007/s10212-020-00526-w

Buhrmester, D., & Prager, K. (1995). Patterns and functions of self-disclosure during childhood and adolescence. In K. Rotenberg (Ed.), *Disclosure processes in children and adolescents* (pp. 10–56). Cambridge University Press. https://doi.org/10.1017/CBO9780511527746.002

Cadima, R., Ojeda, J., & Monguet, J. M. (2012). Social networks and performance in distributed learning communities. *Journal of Educational Technology & Society*, *15*(4), 296–304.

Caprara, G. V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. G. (2000). Prosocial foundations of Children's academic achievement. *Psychological Science*, *11*(4), 302–306. https://doi.org/10.1111/1467-9280.00260

Chow, C. M., Tan, C. C., & Buhrmester, D. (2015). Interdependence of depressive symptoms, school involvement, and academic performance between adolescent friends: A dyadic analysis. *British Journal of Educational Psychology*, *85*(3), 316–331. https://doi.org/10.1111/BJEP.12075

Crosnoe, R., & Benner, A. D. (2015). Children at school. In M. H. Bornstein, T. Leventhal, & R. M. Lerner (Eds.), *Handbook of child psychology and developmental science: Ecological settings and processes*, Vol. 4 (7th ed., pp. 268–304). John Wiley & Sons Inc. https://doi.org/10.1002/9781118963418.childpsy407

Datu, J. A. D., & Park, N. (2019). Perceived school kindness and academic engagement: The mediational roles of achievement goal orientations. *School Psychology International*, *40*(5), 456–473.

del Valle, J. F., Bravo, A., & López, M. (2010). Parents and peers as providers of support in adolescents' social network: A developmental perspective. *Journal of Community Psychology*, *38*(1), 16–27. https://doi.org/10.1002/jcop.20348

Demanet, J., & van Houtte, M. (2012). School belonging and school misconduct: The differing role of teacher and peer attachment. *Journal of Youth and Adolescence*, *41*(4), 499–514. https://doi.org/10.1007/s10964-011-9674-2

Deptula, D. P., & Cohen, R. (2004). Aggressive, rejected, and delinquent children and adolescents: A comparison of their friendships. *Aggression and Violent Behavior*, *9*(1), 75–104. https://doi.org/10.1016/S1359-1789(02)00117-9

Dieterich, S. E. (2015). *The coevolution of adolescent friendship networks and school outcomes*. https://dspace.library.colostate.edu/handle/10217/167097

Dijkstra, J. K., & Gest, S. D. (2015). Peer norm salience for academic achievement, prosocial behavior, and bullying: Implications for adolescent school experiences. *The Journal of Early Adolescence*, *35*(1), 79–96. https://doi.org/10.1177/0272431614524303

Dijkstra, J. K., Lindenberg, S., & Veenstra, R. (2007). Same-gender and cross-gender peer acceptance and peer rejection and their relation to bullying and helping among preadolescents: Comparing predictions from gender-homophily and goal-framing approaches. *Developmental Psychology*, *43*(6), 1377–1389. https://doi.org/10.1037/0012-1649.43.6.1377

Dokuka, S., Valeeva, D., & Yudkevich, M. (2020). How academic achievement spreads: The role of distinct social networks in academic performance diffusion. *PLoS One*, *15*(7), e0236737. https://doi.org/10.1371/JOURNAL.PONE.0236737

Dowson, M., & McInerney, D. M. (2003). What do students say about their motivational goals?: Towards a more complex and dynamic perspective on student motivation. *Contemporary Educational Psychology*, *28*(1), 91–113. https://doi.org/10.1016/S0361-476X(02)00010-3

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). *Prosocial development*. John Wiley & Sons Inc.

Espelage, D. L., Holt, M. K., & Henkel, R. R. (2003). Examination of peer–group contextual effects on aggression during early adolescence. *Child Development*, *74*(1), 205–220. https://doi.org/10.1111/1467-8624.00531

Fabes, R. A., Carlo, G., Kupanoff, K., & Laible, D. (1999). Early adolescence and prosocial/moral behavior I: *The. Journal of Early Adolescence*, *19*(1), 5–16. https://doi.org/10.1177/0272431699019001001

Flashman, J. (2012). Academic achievement and its impact on friend dynamics. *Sociology of Education*, *85*(1), 61–80. https://doi.org/10.1177/0038040711417014

Gibbons, F. X., Blanton, H., Gerrard, M., Buunk, B., & Eggleston, T. (2000). Does social comparison make a difference? Optimism as a moderator of the relation between comparison level and academic performance. *Personality and Social Psychology Bulletin*, *26*(5), 637–648. https://doi.org/10.1177/0146167200267011

Gifford-Smith, M. E., & Brownell, C. A. (2003). Childhood peer relationships: Social acceptance, friendships, and peer networks. *Journal of School Psychology*, *41*(4), 235–284. https://doi.org/10.1016/S0022-4405(03)00048-7

Glick, G. C., & Rose, A. J. (2011). Prospective associations between friendship adjustment and social strategies: Friendship as a context for building social skills. *Developmental Psychology*, *47*(4), 1117–1132.

Gremmen, M. C., Berger, C., Ryan, A. M., Steglich, C. E. G., Veenstra, R., & Dijkstra, J. K. (2018). Adolescents' friendships, academic achievement, and risk behaviors: Same-behavior and Cross-behavior selection and influence processes. *Child Development*, *90*(2), e192–e211. https://doi.org/10.1111/cdev.13045

Gremmen, M. C., Dijkstra, J. K., Steglich, C., & Veenstra, R. (2017). First selection, then influence: Developmental differences in friendship dynamics regarding academic achievement. *Developmental Psychology*, *53*(7), 1356–1370. https://doi.org/10.1037/dev0000314

Gremmen, M. C., van den Berg, Y. H. M., Segers, E., & Cillessen, A. H. N. (2016). Considerations for classroom seating arrangements and the role of teacher characteristics and beliefs. *Social Psychology of Education*, *19*(4), 749–774. https://doi.org/10.1007/s11218-016-9353-y

Hartl, A. C., Laursen, B., & Cillessen, A. H. N. (2015). A survival analysis of adolescent friendships: The downside of dissimilarity. *Psychological Science*, *26*(8), 1304–1315. https://doi.org/10.1177/0956797615588751

Hasan, S., & Bagde, S. (2013). The mechanics of social capital and academic performance in an Indian college. *American Sociological Review*, *78*(6), 1009–1032. https://doi.org/10.1177/0003122413505198

Hiatt, C., Laursen, B., Mooney, K. S., & Rubin, K. H. (2015). Forms of friendship: A person-centered assessment of the quality, stability, and outcomes of different types of adolescent friends. *Personality and Individual Differences*, *77*, 149–155. https://doi.org/10.1016/J.PAID.2014.12.051

Hoffman, A. S., Hamm, J. V., Lambert, K., & Meece, J. (2020). Peer-collaborator preferences of African American and White sixth-graders in mathematics classrooms. *The Journal of Experimental Education*, *88*(4), 559–577. https://doi.org/10.1080/00220973.2019.1615857

Hommes, J., Rienties, B., de Grave, W., Bos, G., Schuwirth, L., Scherpbier, A., de Grave, W., Bos, G., Schuwirth, L., & Scherpbier, A. (2012). Visualising the invisible: A network approach to reveal the informal social side of student learning. *Advances in Health Sciences Education*, *17*(5), 743–757. https://doi.org/10.1007/s10459-012-9349-0

Johnson, D., & Gastic, B. (2014). Patterns of bullying in single-sex schools. *Sexuality Research & Social Policy*, *11*(2), 126–136. https://doi.org/10.1007/s13178-014-0146-9

Kiefer, S. M., & Ryan, A. M. (2011). Students' perceptions of characteristics associated with social success: Changes during early adolescence. *Journal of Applied Developmental Psychology*, *32*(4), 218–226. https://www-sciencedirect-com.proxy-ub.rug.nl/science/article/pii/S0193397311000700#bb0235

Kilday, J. E., & Ryan, A. M. (2023). Who do students ask for help with classwork? Sources of help and changes in help-seeking from peers during early adolescence. *The Journal of Early Adolescence*, *43*(6), 746–783. https://doi.org/10.1177/02724316221124784

Kindermann, T. A. (2007). Effects of naturally existing peer groups on changes in academic engagement in a cohort of sixth graders. *Child Development*, *78*(4), 1186–1203. https://doi.org/10.1111/j.1467-8624.2007.01060.x

Kretschmer, D., Leszczensky, L., & Pink, S. (2018). Selection and influence processes in academic achievement—More pronounced for girls? *Social Networks*, *52*, 251–260. https://doi.org/10.1016/J.SOCNET.2017.09.003

Kuhlmeier, V. A., Dunfield, K. A., & O'Neill, A. C. (2014). Selectivity in early prosocial behavior. *Frontiers in Psychology*, *5*, 836. https://doi.org/10.3389/FPSYG.2014.00836

LaFontana, K. M., & Cillessen, A. H. N. (2002). Children's perceptions of popular and unpopular peers: A multimethod assessment. *Developmental Psychology*, *38*(5), 635–647. https://doi.org/10.1037/0012-1649.38.5.635

Larson, R., Jarrett, R., Hansen, D., Pearce, N., Sullivan, P., Walker, K., Watkins, N., & Wood, D. (2012). Organized youth activities as contexts for positive development. In J. L. Mahoney, R. W. Larson, & J. S. Eccles (Eds.), *Positive psychology in practice* (pp. 540–560). John Wiley & Sons, Inc. https://doi.org/10.1002/9780470939338.ch33

Laursen, B., & Veenstra, R. (2021). Toward understanding the functions of peer influence: A summary and synthesis of recent empirical research. *Journal of Research on Adolescence*, *31*(4), 889–907. https://doi.org/10.1111/JORA.12606

Liem, G. A. D. (2016). Academic and social achievement goals: Their additive, interactive, and specialized effects on school functioning. *British Journal of Educational Psychology*, *86*(1), 37–56. https://doi.org/10.1111/BJEP.12085

Luengo Kanacri, B. P., Eisenberg, N., Thartori, E., Pastorelli, C., Uribe Tirado, L. M., Gerbino, M., & Caprara, G. V. (2017). Longitudinal relations among positivity, perceived positive school climate, and prosocial behavior in Colombian adolescents. *Child Development*, *88*(4), 1100–1114. https://doi.org/10.1111/cdev.12863

Luengo Kanacri, B. P., & Jiménez-Moya, G. (2017). Good practices on civic engagement in Chile and the role of promoting prosocial behaviors in school settings. In B. García-Cabrero, A. Sandoval-Hernández, E. Treviño-Villareal, S. D. Ferráns, & M. G. P. Martínez (Eds.), *Civics and citizenship* (pp. 241–254). SensePublishers. https://doi.org/10.1007/978-94-6351-068-4_11

Luengo Kanacri, B. P., Pastorelli, C., Eisenberg, N., Zuffianò, A., Castellani, V., & Caprara, G. V. (2014). Trajectories of prosocial behavior from adolescence to early adulthood: Associations with personality change. *Journal of Adolescence*, *37*(5), 701–713. https://doi.org/10.1016/J.ADOLESCENCE.2014.03.013

McGuire, A. M. (2003). "It was nothing" - extending evolutionary models of altruism by two social cognitive biases in judgments of the costs and benefits of helping. *Social Cognition*, *21*(5), 363–394. https://doi.org/10.1521/soco.21.5.363.28685

McInerney, D. M., & Ali, J. (2006). Multidimensional and hierarchical assessment of school motivation: Cross-cultural validation. *Educational Psychology*, *26*(6), 717–734. https://doi.org/10.1080/01443410500342559

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*(1), 415–444. https://doi.org/10.1146/annurev.soc.27.1.415

Merton, R. K. (1968). The Matthew effect in science. *Science*, *159*(3810), 56–63. https://doi.org/10.1126/science.159.3810.56

Molloy, L. E., Gest, S. D., & Rulison, K. L. (2011). Peer influences on academic motivation: Exploring multiple methods of assessing Youths' Most "influential" peer relationships. *The Journal of Early Adolescence*, *31*(1), 13–40. https://doi.org/10.1177/0272431610384487

Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review*, *1*(3), 224–246. https://doi.org/10.1016/0273-2297(81)90019-8

Newcomb, A. F., & Bagwell, C. L. (1995). Children's friendship relations: A meta-analytic review. *Psychological Bulletin*, *117*(2), 306–347. https://doi.org/10.1037/0033-2909.117.2.306

Newman, R. S. (2000). Social influences on the development of children's adaptive help seeking: The role of parents, teachers, and peers. *Developmental Review*, *20*(3), 350–404. https://doi.org/10.1006/drev.1999.0502

Ng-Knight, T., Shelton, K. H., Riglin, L., Frederickson, N., McManus, I. C., & Rice, F. (2019). 'Best friends forever'? Friendship stability across school transition and associations with mental health and educational attainment. *British Journal of Educational Psychology*, *89*(4), 585–599. https://doi.org/10.1111/BJEP.12246

Nichols, J. D., & White, J. (2001). Impact of peer networks on achievement of high school algebra students. *Journal of Educational Research*, *94*(5), 267–273. https://doi.org/10.1080/00220670109598762

Nowicki, E. A. (2003). A meta-analysis of the social competence of children with learning disabilities compared to classmates of low and average to high achievement. *Learning Disability Quarterly*, *26*(3), 171–188. https://doi.org/10.2307/1593650

Palacios, D., Dijkstra, J. K., Villalobos, C., Treviño, E., Berger, C., Huisman, M., & Veenstra, R. (2019). Classroom ability composition and the role of academic performance and school misconduct in the formation of academic and friendship networks. *Journal of School Psychology*, *74*, 58–73. https://doi.org/10.1016/J.JSP.2019.05.006

Palacios, D., & Villalobos, C. (2016). Academic networks within Chilean schools: An exploratory study using exponential random graph models (ERGM). *Redes. Revista Hispana Para El Análisis de Redes Sociales*, *27*(2), 33–44. https://doi.org/10.5565/rev/redes.631

Peters, E., Cillessen, A. H. N., Riksen-Walraven, J. M., & Haselager, G. J. T. (2010). Best friends' preference and popularity: Associations with aggression and prosocial behavior. *International Journal of Behavioral Development*, *34*(5), 398–405. https://doi.org/10.1177/0165025409343709

Rambaran, J. A., Hopmeyer, A., Schwartz, D., Steglich, C., Badaly, D., & Veenstra, R. (2017). Academic functioning and peer influences: A short-term longitudinal study of network-behavior dynamics in middle adolescence. *Child Development*, *88*(2), 523–543. https://doi.org/10.1111/cdev.12611

Rigney, D. (2010). *The Matthew effect: How advantage begets further advantage*. Columbia University Press.

Ripley, R. M., Snijders, T. A. B., Boda, Z., Voros, A., & Preciado, P. (2018). *Manual for RSIENA*. (may 24, 2018). University of Oxford, Department of Statistics; Nuffield College. http://www.stats.ox.ac.uk/~snijders/siena/

Rodkin, P. C., & Ryan, A. M. (2012). Child and adolescent peer relations in educational context. In K. R. Harris, S. Graham, T. Urdan, S. Graham, J. M. Royer, & M. Zeidner (Eds.), *APA educational psychology handbook, vol 2: Individual differences and cultural and contextual factors* (pp. 363–389). American Psychological Association.

Ryan, A. M., & Shin, H. (2011). Help-seeking tendencies during early adolescence: An examination of motivational correlates and consequences for achievement. *Learning and Instruction*, *21*(2), 247–256. https://doi.org/10.1016/j.learninstruc.2010.07.003

Schacter, H. L., White, S. J., Chang, V. Y., & Juvonen, J. (2014). "Why me?": Characterological self-blame and continued victimization in the first year of middle school. *Journal of Clinical Child & Adolescent Psychology*, *44*(3), 1–10. https://doi.org/10.1080/15374416.2013.865194

Sijtsema, J. J., Lindenberg, S. M., & Veenstra, R. (2010). Do they get what they want or are they stuck with what they can get? Testing homophily against default selection for friendships of highly aggressive boys. The TRAILS study. *Journal of Abnormal Child Psychology*, *38*(6), 803–813. https://doi.org/10.1007/s10802-010-9402-5

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research*, *75*(3), 417–453. https://doi.org/10.3102/00346543075003417

Snijders, T., & Lomi, A. (2019). Beyond homophily: Incorporating actor variables in statistical network models. *Network Science*, *7*(1), 1–19. https://doi.org/10.1017/nws.2018.30

Snijders, T. A. B., & Baerveldt, C. (2003). A multilevel network study of the effects of delinquent behavior on friendship evolution. *The Journal of Mathematical Sociology*, *27*(2–3), 123–151. https://doi.org/10.1080/00222500305892

Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks*, *32*(1), 44–60. https://doi.org/10.1016/j.socnet.2009.02.004

Stadtfeld, C., Vörös, A., Elmer, T., Boda, Z., & Raabe, I. J. (2019). Integration in emerging social networks explains academic failure and success. *Proceedings of the National Academy of Sciences of the United States of America*, *116*(3), 792–797. https://doi.org/10.1073/pnas.1811388115

Sullivan, H. S. (Ed.). (1953). *The interpersonal theory of psychiatry* (1st ed.). Routledge. https://doi.org/10.4324/9781315014029

Sullivan, K., Marshall, S. K., & Schonert-Reichl, K. A. (2002). Do expectancies influence choice of help-giver? Adolescents' criteria for selecting an informal helper. *Journal of Adolescent Research*, *17*(5), 509–531. https://doi.org/10.1177/0743558402175005

van Rijsewijk, L., Dijkstra, J. K., Pattiselanno, K., Steglich, C., & Veenstra, R. (2016). Who helps whom? Investigating the development of adolescent prosocial relationships. *Developmental Psychology*, *52*(6), 894–908. https://doi.org/10.1037/dev0000106

van Rijsewijk, L. G. M., Snijders, T. A. B., Dijkstra, J. K., Steglich, C., & Veenstra, R. (2020). The interplay between adolescents' friendships and the exchange of help: A longitudinal multiplex social network study. *Journal of Research on Adolescence*, *30*(1), 63–77. https://doi.org/10.1111/jora.12501

Veenstra, R., & Lodder, G. M. A. (2022). On the microfoundations of the link between classroom social norms and behavioral development. *International Journal of Behavioral Development*, *46*(5), 453–460. https://doi.org/10.1177/01650254221100228

Vitaro, F., Boivin, M., & Bukowski, W. M. (2009). The role of friendship in child and adolescent psychosocial development. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups* (pp. 568–585). The Guilford Press.

Weber, H., Schwenzer, M., & Hillmert, S. (2020). Homophily in the formation and development of learning networks among university students. *Network Science*, *8*(4), 469–491. https://doi.org/10.1017/NWS.2020.10

Young, F. W., & Glasgow, N. (1998). Voluntary social participation and health. *Research on Aging*, *20*(3), 339–362. https://doi.org/10.1177/0164027598203004

How to cite this article: Palacios, D., Berger, C., Kanacri, B. P. L., Huisman, M., & Veenstra, R. (2024). The role of academic performance, prosocial behaviour and friendships on adolescents' preferred studying partners: A longitudinal social network analysis. *British Journal of Educational Psychology*, *00*, 1–19. https://doi.org/10.1111/bjep.12675

APPENDIX A

MODEL COMPARISON BETWEEN THE TWO TYPES OF CLASSROOMS

Two separate meta-analyses were conducted for each model (without and with the interactions): the first for intervention classrooms and the second for control classrooms (see Table A1). To test for significant differences between the parameter estimates related to the hypotheses, we then performed a z-score test under the null hypothesis of equal parameters with an approximate standard normal distribution (for more details see Ripley et al., 2018, p. 108). Regarding model 1, we found a significant effect for high achievers being preferred as academic partners in both intervention and control classrooms (Est.$_{intervention}$ = .512, $p < .001$; Est.$_{control}$ = .352, $p < .01$). However, a significant difference was found between the parameters of the two effects ($z = 1.940$, $p = .02$). Regarding model 2, we found no significant differences between the estimates from the two types of classrooms.

TABLE A1 Comparison between RSiena meta-analysis of academic preference networks for intervention and control classrooms.

| | Model 1 | | | | | | Model 2 | | | | | |
| | Intervention | | | Control | | | Intervention | | | Control | | |
Effects	Est.	SE	σ	Est.	SE	σ	Est.	SE	σ	Est.	SE	σ
Academic preference networks												
Density	1.21***	.20	.33	−1.72***	.17	.00	−1.03***	.28	.56*	−1.74***	.21	.10
Reciprocity	.85***	.10	.00	.90***	.12	.00	.81***	.10	.00	.88***	.12	.00
Transitivity	.29***	.05	.10	.28***	.08	.15	.29***	.05	.09	.27***	.07	.14*
Indegree-popularity	.02	.01	.00	.07***	.02	.04*	.02	.01	.00	.08***	.02	.04*
Outdegree-popularity	−.16***	.04	.00	−.21***	.05	.02*	−.16***	.02	.00	−.20***	.05	.00
Same gender	.53	.09	.16	.32**	.09	.15	.51***	.08	.14	.31**	.09	.14
Parents education similarity	.05	.14	.00	−.13	.23	.16	.05	.14	.00	−.14	.23	.00
Academic performance *alter* (H1)	.51***	.06	.00	.35**	.11	.19	.36**	.12	.10	.54*	.27	.28
Academic performance *ego*	−.16**	.05	.00	−.17*	.07	.00	−.07	.11	.00	.20	.33	.41
Academic performance *ego × alter* (H5)	.18**	.07	.00	.17	.14	.19	.18	.07	.05	.20	.16	.25
Prosocial behaviour *alter* (H2)	.21*	.10	.19	.34***	.09	.00	.21*	.10	.19	.34***	.09	.00
Prosocial behaviour *ego*	−.01	.06	.00	−.13	.08	.00	−.01	.06	.00	−.12	.08	.01
Prosocial behaviour *ego × alter*	−.09	.12	.00	.47*	.18	.22	−.10*	.12	.00	.46*	.20	.28
Friendship (H3)	.30	.14	.32***	.12	.08	.17**	.46***	.09	.15	.14	.09	.19**
Academic performance *alter* × Friendship (H4)	–	–	–	–	–	–	−.10	.11	.00	−.02	.13	.00
Academic performance *ego* × Friendship (H6)	–	–	–	–	–	–	.17	.10	.19	.28	.21	.30
Dummy *ego*	−.02	.07	.08	.15	.09	.00	−.02	.07	.08	.16	.10	.00
Dummy reciprocity	−.01	.26	.51*	−.35	.29	.53	−.01	.27	.55*	−.36	.30	.56*

Abbreviations: Est., estimate; *SE*, standard error; σ, estimated between-classroom standard deviation.

*p < .05; **p < .01; ***p < .001.