
Relational predictors of perceived popularity in a sample of school-based adolescents: A multilevel analysis

Predictores relacionales de la popularidad percibida en una muestra de adolescentes escolarizados: un análisis multinivel

在校青少年样本中感知受欢迎程度的关系预测因素:多层次分析

Предикторы восприятия популярности в выборке школьников-подростков: многоуровневый анализ

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Abstract

Popularity is a key construct to understand social influence processes among peers during adolescence. Popular individuals are socially visible, their behavior is imitated, and they occupy central positions in the peer system. Literature differentiates between sociometric popularity (individuals who like others and develop prosocial behaviors) and perceived popularity (reputable individuals who develop disruptive behaviors). The objective of the study is to identify the relational determinants of perceived popularity in a sample of Mexican high school students, including the effect of the mean age of the classrooms to which participants are assigned.

Participants are 407 students ($n = 273$ women; 67.1%) aged between 14 and 22 years ($M = 15.55$; $SD = .99$). Network analysis and multilevel techniques were used.

Results shows that the mean age of the class is an explanatory factor for the variability of the dependent and the analysis of the fixed effects parameters indicates that being central in the network of positive links is the relational predictor that best explains perceived popularity ($\gamma_02 = .65$; $t = 16.820$; $p < .00001$; $CI95\%: .58 - .73$).

Perceived popularity is a complex and dual phenomenon in which features of perceived and sociometric popularity overlap. Understanding the factors that determine perceived popularity is crucial to ensure the psychosocial adjustment of young people in educational contexts.

Keywords: Interpersonal relationships, multilevel analysis, network analysis, popularity, social behavior, social influence.

Resumen

La popularidad es clave para comprender los procesos de influencia entre iguales durante la adolescencia. Los individuos populares son visibles socialmente, su conducta es imitada y ocupan posiciones centrales dentro del sistema de pares. La literatura diferencia entre popularidad sociométrica (individuos que agradan y desarrollan conductas prosociales) y popularidad percibida (individuos reputados y que desarrollan conductas disruptivas). El objetivo del estudio es identificar los determinantes relacionales de la popularidad percibida en una muestra de estudiantes mexicanos de educación secundaria, incluyendo el efecto de la edad media de las clases a las que están asignados los participantes.

Los participantes son 407 estudiantes ($n = 273$ mujeres; 67.1%) con edades comprendidas entre 14 y 22 años ($M = 15.55$; $DT = .99$). Se emplearon técnicas de análisis de redes y análisis multinivel.

Los resultados muestran que la edad media de la clase es un factor explicativo de la variabilidad de la dependiente y el análisis de los parámetros de efectos fijos del modelo multinivel indica que ser central en la red de vínculos positivos es el predictor relacional que mejor explica la popularidad percibida ($\gamma_02 = .65$; $t = 16.820$; $p < .00001$; $IC95\%: .58 - .73$).

La popularidad percibida es un fenómeno complejo y dual en el que se solapan rasgos de la popularidad percibida y sociométrica. Comprender los factores que determinan la popularidad percibida es crucial para garantizar el ajuste psicosocial de los jóvenes en contextos educativos.

Palabras clave: análisis multinivel, análisis de redes, comportamiento social, influencia social, popularidad, relaciones interpersonales.

概要

受欢迎程度是理解青春期同伴影响过程的关键。受欢迎的个人在社会上是可见的，他们的行为会被模仿，并且他们在同侪体系中占据中心地位。文献区分了社会受欢迎度（受到喜爱并发展出亲社会行为的个人）和感知受欢迎度（享有盛誉并发展出破坏性行为的个人）。该研究的目的是确定墨西哥中学学生样本中受欢迎程度的相关决定因素，包括参与者所分配班级的平均年龄的影响。

参与者为 407 名学生（273 名女性；67.1%），年龄在 14 至 22 岁之间（ $M = 15.55$ ； $SD = .99$ ）。研究使用了网络分析和多层次分析技术。

结果表明，班级的平均年龄是依赖性变异性的一个解释因素，并且对多水平模型的固定效应参数的分析表明，处于正关系网络的中心是最好的关系预测因子。解释了感知受欢迎程度（ $\gamma_02 = .65$ ； $t = 16.820$ ； $p < .00001$ ；95% CI: .58 - .73）。

感知受欢迎度是一种复杂的双重现象，其中感知受欢迎度和社会计量学受欢迎度的特征重叠。了解决定受欢迎程度的因素对于确保年轻人在教育环境中进行社会心理调整至关重要。

关键词：多层次分析，网络分析，社会行为，社会影响力，受欢迎程度，人际关系。

Аннотация

Популярность имеет ключевое значение для понимания процессов взаимного влияния сверстников в подростковом возрасте. Популярные личности социально заметны, их поведению подражают, и они занимают центральные позиции в системе отношений со сверстниками. В литературе проводится различие между социометрической популярностью (индивиды, которые нравятся и развивают просоциальное поведение) и воспринимаемой популярностью (индивиды, которые пользуются репутацией и развивают деструктивное поведение). Цель исследования - выявить реляционные детерминанты воспринимаемой популярности в выборке мексиканских старшеклассников, в том числе влияние среднего возраста классов, в которые распределены участники.

В исследовании приняли участие 407 студентов ($n = 273$ девушки; 67.1%) в возрасте от 14 до 22 лет ($M = 15.55$; $SD = .99$). Использовались методы сетевого анализа и многоуровневого анализа.

результаты показывают, что средний возраст класса является объясняющим фактором для изменчивости независимого показателя, а параметрический анализ многоуровневой модели с фиксированными эффектами показывает, что центральное место в сети положительных связей является реляционным предиктором, который лучше всего объясняет воспринимаемую популярность ($\gamma_02 = .65$; $t = 16.820$; $p < .00001$; 95%CI: .58 - .73).

Воспринимаемая популярность - сложный и двойственный феномен, в котором пересекаются черты воспринимаемой и социометрической популярности. Понимание детерминант воспринимаемой популярности имеет решающее значение для обеспечения психосоциальной адаптации молодых людей в образовательных контекстах.

Ключевые слова: многоуровневый анализ, сетевой анализ, социальное поведение, социальное влияние, популярность, межличностные отношения, социальное влияние, межличностные отношения.

Introduction

Preadolescence and adolescence are critical stages for human development in which biological and sociocultural changes are combined that will produce significant effects in later stages of the life cycle (Bronfenbrenner, 1979). During this period arise several changes at biological, familial, and relational levels which determines adolescents' psychosocial adjustment in different socialization environments.

Along with the abrupt physical and maturational changes typical of this stage, other processes take place that alter the way in which adolescents relate to their social environment. First, family progressively loses some power as primary socialization institution, reducing the ability of parents and nuclear family to determine the formation of attitudes and behaviors of adolescents. Second, this progressive loss of capacity come at the expense of the peer group that gains preponderance as reference group, consequently increasing its power to modulate the formation of adolescents' attitudes and behaviors (Steinberg, 2011). Although the aforementioned changes do not act in a homogeneous way throughout pre-adolescence and adolescence, the usual dynamic is that at this stage a certain detachment towards the family context emerges while the influence of peers group on the behavior of young people increases. The main signal of disaffection is the reduction of interactions with the family and, in a compensatory way, the increase in relationships with the peer group. Regarding the family context, both the frequency and the substantive content of interactions between adolescents and their families decrease (Estévez, López, & Musitu, 2007). In this line, Larson, Richards, Moneta, Holmbeck and Duckett (1996) developed a sequential cross-sectional study through which they examined the daily interactions between adolescents and their parents, in children and adolescents aged from 10 to 18. The results of this research showed that the time that young people spend with their parents decreases from 34% in the youngest participants to 15% of the oldest young people.

On the other hand, decreasing interactions between adolescents and their parents is accompanied by a decrease in social support that, until this moment, family has provided to young people. Some studies associate these relational changes with the emergence of disruptive behaviors such as starting to consume alcohol and psychoactive substances (Goldstick et al., 2018; Moreno et al., 2006; Roebroek & Koning, 2016) and with involvement in situations of aggression and harassment (Espelage, 2014; Jiménez & Estévez, 2017; White & Renk, 2012).

In the same way that loss of social support from parents produces effects on adolescents' daily habits and behaviors, the increasing influence of peer group can also foster both positive and negative changes on youths' behavior (Ellis & Zbaratany, 2007). Regarding positive changes, empirical evidence shows that peer groups can influence adolescents' behavior by promoting mutual help dynamics, social support and cooperation in academic tasks and extracurricular activities. These findings come from longitudinal (Gremmen et al., 2017), cross-sectional (Masland & Lease, 2013), and experimental studies (Misch & Dunham, 2021; van Hoorn et al., 2016). These results suggest that psychosocial processes that occur within groups that flourish at these ages may favor the appearance of prosocial behaviors. A longitudinal study carried out in Finland showed that influence patterns exerted by the peer group leads to similar levels of emotional, cognitive, and behavioral involvement of students in the school context (Wang et al., 2018). In another proposal, authors examined the effect that peer group influence induces on cognitive, motivational, and socio-emotional domains, ultimately modifying adolescents' behavior (Wentzel & Ramani, 2016). These findings show that

attitudes formation, cognitive development and adolescents' behaviors are, at least in some extent, contingent on the peer group.

The other side of the coin is negative influence patterns peer group promote on adolescents' attitudes and behavior. Several studies shows that social forces that lead to group uniformity, conformism to accept group norms, and pressure experienced by members to be accepted may trigger antisocial and disruptive behaviors (Friedkin, 2001). Other authors suggest homophily (tendency to choose people perceived as similar to establish relationships) and susceptibility to group pressure are critical factors for understanding influence processes encouraging antisocial behaviors (McCoy et al., 2019; Monahan et al., 2009). Other investigations suggest that need to be recognized and accepted by the group, and desiring to achieve prestigious positions favor negative behaviors (Faris & Ennett, 2012; Sijtsema & Lindenberg, 2018). Given that status is associated with the position that subjects occupy within peer group structure, previous studies point out that perceived popularity is an effective indicator to measure adolescents' status (Ennett et al., 2008). Popularity is a key variable for understanding relationships among adolescents because it plays a crucial role in the (a) acceptance, (b) the ability to influence (and be influenced), (c) and power relations (Cillessen et al., 2011). Next section is focused to examine the role of popularity on adaptive process to peer group.

Popularity in the peer system

Giordano (2003) propose a clear and simple definition of popularity assuming that to be popular is the same to be appreciated. There is a certain consensus that popular people are (a) widely known, that is, they have a certain public notoriety; (b) they are emulated by the other members of the group; (c) and are in central positions within pair system (Adler & Adler, 1998). Although experts recognize that popular children and adolescents tend to develop prosocial behaviors and are a resource of social support for their peers (Rubin et al., 1998), other authors highlights that being popular implies maintaining relationships with many contacts, which can cause popular adolescents to be at greater risk of being influenced by other adolescents who develop antisocial behaviors and thus, they also imitate disruptive behaviors (Allen et al., 2005).

On the other hand, the popularity ratings of adolescents in the peer group are not constant throughout adolescence. Some works have documented that level of popularity in the transition between primary and secondary school is relatively stable (Bukowski & Newcomb, 1984), therefore, abrupt changes in the level of popularity are not frequent in this period (Coie & Dodge, 1983). Other works show that the importance that young people give to popularity and the emphasis on this phenomenon increases notably in the first and second year of secondary school and gradually decreases in access to high school (Jiang & Cillessen, 2005). A longitudinal study showed that changes in the sociometric status of participants were associated with changes in the types of antisocial behaviors participants adopted during that period (van den Berg et al., 2019). This finding evidences the relationship between changes in popularity levels and adolescent behavior, suggesting that age is a relevant variable to understand status within the peer group (Moody et al., 2011).

Parkhurst and Hopmeyer (1998) propose an interesting distinction between sociometric and perceived popularity. In short, adolescents considered popular from a sociometric perspective are socially accepted people and are "liked" by most members of the peer group. While those who identify themselves as popular from the perceived

approach are considered reputable and socially visible people, but not necessarily “liked” by the rest of the group members (Cillessen & Borch, 2006). Individuals who enjoy a high reputation (perceived popularity) tend to place excessive importance on physical appearance, are imitated by other members in the way they dress or the music they listen to and attract other peers who aspire to be part of their social circle (Cillessen & Rose, 2005). This attraction process occurs because peers seek to increase their own status by establishing contact with actors who have higher status. An investigation that analyzed perceived and sociometric popularity found that girls who had high scores in perceived popularity were considered attractive and prosocial, while boys who scored high in this type of popularity were observed as athletic and attractive (Lease et al., 2002). In this sense, given that physical appearance is an attraction factor usually associated with perceived popularity, it can be expected that giving excessive importance to physical appearance contributes to increasing perceived popularity and, consequently, social power within peer groups (Back et al., 2010).

At the same time, being perceived as prosocial (sociometric popularity) is related to having a wide network of contacts with whom relationships are mainly categorized as positive (prosocial). This implies that adolescents who receive many nominations from other peers when asked: *which peers do you like the most?*, are seen as potential providers of help and social support; however, they are not perceived as being as powerful or influential as who are socially visible and have high perceived popularity (Cillessen & Rose 2005; Kupersmidt & Dodge, 2004; Lease, Kennedy, & Axelrod, 2002; Parkhurst & Hopmeyer, 1998). Therefore, it can be expected that individuals who are perceived as prosocial and receive nominations as someone to like, will present higher levels of sociometric popularity. Although findings on the role that positive relationships play in both kinds of popularity are contradictory, studies reflect those adolescents considered popular from sociometric, and perceived perspectives share characteristics in common. However, they differ in aspects related to exhibiting antisocial behaviors more frequently (perceived popularity) and are perceived as less powerful (sociometric popularity).

Sociometric popularity identifies subjects who receive multiple nominations from other group members (usually classmates or from the same grade) when asked: *Which peers do you like the most (and least)?* Previous research shows that adolescents with high sociometric popularity are characterized by developing positive behaviors, being accepted by group members, showing adequate emotional adjustment, and not habitually participate in antisocial behaviors (Cillessen & Borch, 2006; Cillessen & Rose 2005; Kupersmidt & Dodge, 2004). On the other hand, perceived popularity identifies subjects who receive several nominations when asking the question: *Which peers are more (and less) popular?* Unlike what happens with sociometric popularity, adolescents identified as popular from the perceived approach are considered aggressive and engage in both prosocial and antisocial behaviors (Parkhurst & Hopmeyer, 1998), and are defined in these terms by their peers (LaFontana & Cillessen, 2002). To calculate both sociometric and perceived popularity index, positive nominations are added, and the negative nominations are subtracted. Executing this simple operation results in a continuous variable that describes the level of sociometric or perceived popularity, depending on the content of the question asked.

This system allows obtaining a score based on the number of nominations received by other classroom members or the same course (Cillessen & Rose 2005, p. 103). However, in last decades there has been an expansion of studies that apply social network analysis (AR) techniques that have been shown to be effective in capturing and evalu-

ating both types of popularity from a relational approach. SNA is relevant in popularity research because it contributes to: (a) identify the position that each group member (classroom or course) occupies in the popularity network; (b) simultaneously study different types of interactions (prosocial and antisocial) that can occur between group members; (c) examines the structural properties of the network that underlies the interactions of the members of a classroom or a course, and (d) links different levels of analysis (individual, dyadic and whole group) that can determine the phenomenon under study (Ramos-Vidal, 2016).

Backgrounds of this study suggests that popular adolescents tend to occupy central positions in the peer group, therefore degree centrality is an indicator of popularity. But the added impact produced by (1) being observed as someone who attaches great importance to physical appearance (perceived popularity trait) and at the same time (2) being considered prosocial individuals (sociometric popularity trait) in perceived popularity has rarely been studied, (3) incorporating the effects that average classroom age (group-level variable).

Based on the empirical evidence presented, the objective of this research is to determine in a sample of Mexican adolescent the effect exerted on perceived popularity (dependent variable) to give excessive importance to physical appearance and being considered prosocial (individual-level independent variables), considering the average classroom age (group-level independent variable).

Method

Participants and procedure

The participants in this research are 407 secondary school students in the periphery of Mexico City ($n=273$ women; 67.1%), aged between 14 and 22 years ($M=15.55$; $SD=.99$). Participants are ascribed to eleven classrooms, whose sizes range from 26 to 47 students. The research team maintained an initial contact with the directors of the institutions with the purpose of publicizing the objectives of the study and the commitment was made to offer feedback to the teaching staff to improve the relational dynamics in the school. The study was previously approved by the ethics committee of the institution responsible for the research project.

Instruments and variables

Each participant received a questionnaire with the structure of a matrix in which a complete list with names of the classroom students appeared in the rows, and different types of possible relationships in the columns. Participants could nominate students with whom they maintain the relationship for which they were asked in each column. This research design is common when socio-centric studies in which the name of the subjects that form part of the social system under study is previously known, in this case the students enrolled in the eleven classrooms evaluated.

Dependent variable is the nominations received (named In-degree centrality) in the perceived popularity network. Due to the different classroom size and consequently, that values of In-degree centrality can vary widely from one classroom to another, it was decided to use the normalized values that allow the comparison between

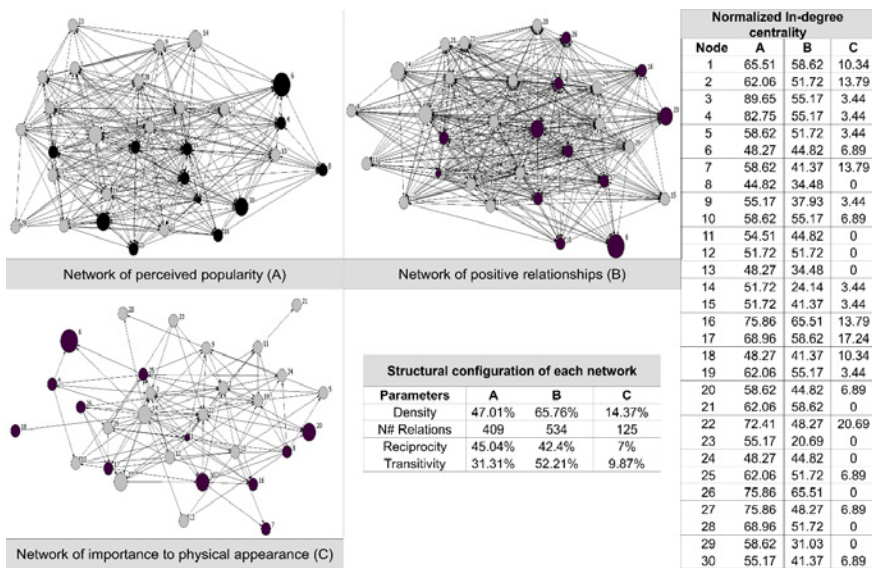
classrooms. Each participant assigned 0 to the classmates they considered “not at all popular”, and 1 to those they considered “somewhat popular”, and 2 to those they considered “very popular”. In a second stage, the matrix was dichotomized, obtaining a symmetric square matrix with binary code (0= not popular at all; 1= popular).

Individual-level independent variables are the nominations received (In-degree centrality) in the importance to physical appearance network and in the positive interactions network. To calculate both measures, students had to mark with an X to classmates who considered physical appearance very important and classmates with whom they had a positive relationship, respectively. As with the dependent variable, it was decided to use the normalized values of both indicators to compare the values between classrooms. Second level independent variable is the mean age of the students in each classroom.

Figure 1 shows an example of popularity, importance to physical appearance and positive ties networks in the same classroom including 30 students. The figure also reports the normalized In-degree centrality value of each student in the three networks and the measures of structural cohesion of each network. Node size represents the age of each participant, and the color identifies sex (gray color= girls; black color= boys).

Figure 1

Illustration of three networks in the same classroom indicating the structural properties of each network and In-degree centrality values of each student



Data analysis

In a first step, In-degree centrality parameters were calculated with Ucinet software (Borgatti et al., 2002). Second, values were exported to SPSS® software (Version 27.0. Armonk, NY: IBM Corp) for conducting multilevel analysis. This research technique is suitable when participants are grouped into larger units of information (in this case,

the classrooms). Multilevel analysis is recommended when it is assumed that there is greater homogeneity within each higher order unit in relation to the dependent variable and that certain variability of the dependent can be attributable to a factor corresponding to a higher order hierarchical structure (Goldstein, 2011). In this work, the higher order variable is the average age of the students in each classroom. It was decided to include age because previous studies show that it is a prominent factor in explaining popularity in the peer system (Giordano, 2003; Moody et al., 2011). It should be clarified that age of each participant is an individual level variable, but average age of each classroom constitutes a second level variable by describing a property of each classroom.

Following previous studies, we proceeded to center the variables so that the coefficients of the models could be easily interpreted (Pardo et al., 2007). The same authors suggest running a two-step procedure to properly fit and interpret multilevel models. In a first step, an analysis of variance of a random effects factor (AVREF) is developed. This model, also known as the null model, does not include any independent variable, but it is useful to determine, through comparison with it, the fit of other models. In this study, AVREF model reports variability of the dependent variable within each classroom and variability of mean age in all classrooms.

Once null model was calculated, next step was to execute a random coefficient regression analysis (RCRA) in which In-degree centrality in the importance to physical appearance network and in positive interactions network (Level 1), and as group level (Level 2) independent variable the mean age of each classroom. Different global fit parameters were calculated to identify the degree to which the multilevel model represent variability present in the data. The adjustment measures used are the deviation (-2LL), the Akaike information criterion (AIC), the Akaike information criterion corrected (AICC), the consistent Akaike information criterion (CAIC), and the Bayesian information criterion (BIC). In summary, all the parameters are a function of the first (-2LL) that penalize, increasing their value, when new variables are incorporated into the model, so that the lower the value of these statistics, the greater the global adjustment of the model (Snijders & Bosker, 2011). Next section presents the results.

Results

Table 1 shows descriptive statistics and bivariate correlations between the dependent variable, age of participants, and level 1 independent variables.

Table 1

Descriptive statistics of the dependent and independent variable and bivariate correlations (N= 407)

Nº	Parameters	Min.	Max.	M	SD	1	2	3	4
1	In-degree centrality (pop.)	1.72	14.53	5.87	2.01	----			
2	Age	14	22	15.55	.99	-.295**	----		
3	In-degree centrality (Phys.)	0	6.90	1.54	1.25	.396**	-.042	----	

N°	Parameters	Min.	Max.	M	SD	1	2	3	4
4	In-degree centrality (Post.)	.25	9.85	4.24	1.61	.554**	-.026	-.021	----

Note. M= Mean; SD= Standard Deviation; In-degree centrality (pop.) = In-degree centrality in perceived popularity network; In-degree centrality (Phys.) = In-degree centrality in the importance to physical appearance network; In-degree centrality (Post.) = In-degree centrality in positive interaction network; ** = $p < .0001$

Regarding bivariate relationships between the variables introduced in the RCRA model, a moderately high negative covariance is observed between the dependent variable and participants age ($r = -.295$; $p < .0001$). This result indicates that the perceived popularity tends to decrease as the age of the participants increases, in line with the findings reported in previous studies (Cillessen & Borch, 2006; Giordano, 2003; Young, 2014). Perceived popularity tends to be stable during early adolescence and decline during the transition from middle school to high school. A strong positive covariance relationship is also observed between perceived popularity and level 1 independent variables. The powerful association is observed between perceived popularity and In-degree centrality in positive ties network ($r = .554$; $p < .0001$). This finding is commented in detail in discussion section. Table 2 shows the global fit indicators of the AVREF (null model) and RMR models.

Table 2
AVREF and RCRA global model fit information criteria

Parameters	AVREF	RCRA
-2LL	1441.618	1102.575
AIC	1445.618	1106.575
AICC	1445.648	1106.605
CAIC	1455.631	1116.578
BIC	1453.631	1114.578

Given that the global fit parameters of the models are optimal the lower their value, the information that appears in Table 2 seems to indicate that the RCRA model adequately fits the data. When the 2-LL statistic of AVREF model (1441.62) is compared with the same parameter of RCRA model (1102.57), we can appreciate that the alternative model better fits the data, which justifies the inclusion of second level independent variables in the model. On the other hand, if we observe the slight increase that occurs in AIC, AICC, CAIC and BIC indicators, compared to the reference parameter -2LL (1102.57), it can be concluded that this small change indicates that by including additional independent variables does not significantly affect the global adjustment of the model.

Once global fit indicators of AVREF and RCRA models have been shown, null model is briefly described below, focusing on Coefficient of Variation (CV) and Intraclass Correlation Coefficient (ICC). Table 3 shows descriptive statistics of our dependent variable in the eleven classrooms examined, showing the mean, standard deviation, and CV.

Table 3

Descriptive statistics of the dependent variable in all classrooms

Classrooms	<i>n</i>	M	SD	CV
1	45	6.8	1.42	21.0%
2	47	7.15	1.54	21.6%
3	42	7.31	1.59	21.8%
4	38	6.35	.95	15.0%
5	47	8.1	1.21	15.0%
6	26	3.42	.79	23.2%
7	30	4.86	.79	16.5%
8	37	4.73	1.64	34.6%
9	38	4.68	1.92	41.1%
10	28	4.45	.88	20.0%
11	29	3.66	.98	26.8%
Total	407	5.87	2.01	34.3%

Note. CV= Coefficient of variation between Standard Deviation (SD) and Mean (M)

Null model allows to know CV which express quotient between standard deviation and mean of the dependent variable. This analysis provides information about the variability of the dependent variable in the eleven classrooms included in the analysis. The average of In-degree centrality in perceived popularity network is 5.87 (SD= 2.01) and CV between all the classrooms is .343 (34.3%), which shows that there is a notable variation in all the classrooms. ICC represents the degree of variability between different classrooms compared to the variability between students in the same classroom. To calculate ICC index, the estimate of the variance attributable to classroom factor is divided by the sum of this variable and residuals. In this case, covariance effects parameters in Table 4 shows that the variance between classrooms represents $(2.5) / (2.5+1.82) = .578$ or what is the same, 57.8% of total variability. This finding suggests that, in case of the null model, more than half of dependent variability is attributable to the classroom factor.

Table 4

Estimation of covariance effect parameters

Model	Parameters	Estimation	SE	Wald Z	Sig.	IC: 95%	
						Lower	Upper
AVREF	Residual	1.8248	.1296	14.071	.000	1.5875	2.0975
	Variance (Classroom)	2.5006	1.1412	2.191	.028	1.0222	6.1169
RCRA	Residuals	.7635	.0548	13.932	.000	.6633	.8789
	Intercept + Variance In-degree centrality (Phys.) † + Average age classroom [Subject = Classroom]	.0066	.0030	2.192	.028	.0027	.0161

Note. † In-degree centrality (Phys.) = In-degree centrality in importance to physical appearance network; SE = Standard error.

Table 5 presents the estimation of level 1 independent variables fixed effect parameters. Wald Z statistic showing the AVREF model residuals exhibit that In-degree centrality in perceived popularity network differs across all classrooms ($Z = 14.07$; $p < .0001$), while same parameter corresponding to RCRA model ($Z = 13.93$; $p < .0001$) show that level 1 and 2 independent variables also vary in all classrooms.

Table 5

Estimation of fixed-effect parameters

Model	Parameter	Estimate (y)	SE	Df	t	Sig.	CI: 95%	
							Lower	Upper
AVREF	Intercept	5.602 (y_{00})	.4816	10.001	11.631	.0001	4.52	6.67
RCRA	Intercept	5.7805 (y_{00})	.3852	9.876	15.006	.0001	4.9207	6.6403
	In-degree centrality (Phys.) †	.56076 (y_{01})	.0483	76.293	11.598	.0001	.4644	.6570
	In-degree centrality (Post.) ††	.6579 (y_{02})	.0391	402.096	16.820	.0001	.5810	.7348

Note. † In-degree centrality (Phys.) = In-degree centrality in importance to physical appearance network. †† In-degree centrality (Post.) = In-degree centrality in positive interaction network. SE = Standard error.

Table 5 indicates that intercept value (constant) is similar in AVREF ($y_{00} = 5.6$) and RCRA ($y_{00} = 5.78$) models. Relevant data regarding to fixed effects are found in the values associated with the independent variables included in the RCRA model, that is, effects produced by In-degree centrality in importance to physical appearance network ($y_{01} = .56$) and In-degree centrality in positive interaction network ($y_{02} = .65$) on perceived popularity (dependent). In case of the first independent variable, an estimation $y_{01} = .56$ means that for each point that In-degree centrality in importance to physical appearance network increases, perceived popularity increases by .56 points. Consider-

ing t-statistic value (11.598) and p-value associated with this parameter ($p < .00001$), In-degree centrality in importance to physical appearance network has a wide power to determine the variability of dependent at level 1.

At the same time, the second independent variable produces a significantly higher effect than the previous one ($\gamma_2 = .65$). Given that for each unit that increases In-degree centrality in positive interaction network, perceived popularity increases by 0.65 points ($t = 16.820$; $p < .00001$). This finding confirms that In-degree centrality in positive interaction network (variable associated with sociometric popularity) is more determinant than In-degree centrality in importance to physical appearance network (variable associated with perceived popularity) to explain the variance of the dependent (Cillessen & Rose, 2005).

Table 4 shows that the value of residuals in the RCRA model ($\sigma_e^2 = .76$) is lower than observed in AVREF model ($\sigma_e^2 = 1.82$). Since residuals in RCRA model is lower than that identified in the AVREF model, this result suggests that some dependent variability is attributable to average classroom age. To know the proportion of the variance explained by level 1 independent variables, next formulae can be applied ($1.82 - .76$) / 1.82 . The result (.58) means that by including two level 1 independent variables in regression model, the variability within each classroom is reduced around 60%. Also, the variance of the intercepts is slightly greater than 0 ($\sigma_u^2 = .006$; $p < .028$), which shows that classrooms regression equations intercepts are different. Main findings are discussed below.

Discussion

Understanding relational factors that explain perceived popularity makes it possible to unravel several psychosocial processes within peer groups that occur during adolescence (Cillessen et al., 2011; Kupersmidt & Dodge, 2004). This work shows that centrality in positive ties network (factor associated to sociometric popularity) is more determinant than centrality in importance to physical appearance network (factor associated to perceived popularity) in explaining the variability of perceived popularity. This finding shows that a rigorous evaluation of this psychosocial phenomenon requires assuming that popularity is a construct in which sociometric, and perceived features overlap. (LaFontana & Cillessen, 2002; Parkhurst & Hopmeyer, 1998). Although previous studies show that there is a certain degree of overlap between both types of popularity during adolescence (Cillessen & Borch, 2006), It is feasible to suggest that there are sociodemographic and contextual factors that make each type of popularity more salient in specific relational environments.

In this research, In-degree centrality in positive interaction network, which constitutes a predominant trait of popular subjects from the sociometric approach, is the main predictor of perceived popularity. While In-degree centrality in importance to physical appearance network, although it contributes to explaining some variance of perceived popularity at level 1, its role in the multilevel model is not as prominent as the other individual-level predictor. To the extent that placing great importance on physical appearance is a distinctive feature of perceived popularity, the theoretical background leads us to expect this independent variable should have greater power to explain the variability of perceived popularity.

Future studies should try to understand the meaning that young people and adolescents give to being popular in specific relational contexts. From this view, Lease, Ken-

nedy and Axelrod (2002) conducted a study with children between ages of 10 and 12, finding that participants considered perceived popularity was moderately related both to social status within peer group (sociometric popularity) and to social dominance (perceived popularity). However, as Bukowski (2011) points out, research analyzing popularity within peer system rarely offer a concise description of this construct. This seems to indicate that the meaning of popularity identified by Lease et al. (2002) in children 10 to 12 years old, does not fully coincide with the meaning that older adolescents (eg, 14 to 18 years old) give to being popular.

On the other hand, it is likely that the relational context in which perceived popularity is evaluated can exert some influence on social construction of the concept itself. This research has examined perceived popularity within institutionalized groups such as classrooms in educational centers. In these group contexts, cooperation tends to prevail, symmetrical relationships are promoted and group members do not choose to belong to these groups. (Valiente et al., 2020). In contrast, outside of school, peer groups which also constitutes socialization environments, has its own "game rules". In peer groups (a) the appearance of conflicts to unbalance power relations is common; (b) endogroup norms emerge conditioning the behavior of group members; (c) there is a strong pressure towards conformism and behavior uniformity; and (d) social influence processes affect on attitudes formation and model prosocial and disruptive behaviors (Ellis & Zarbatany, 2007; Faris & Ennett, 2012; Friedkin, 2001). These group processes can influence the social construction of popularity that adolescents develop in each context. Therefore, research that assesses sociometric and perceived popularity in school settings should be complemented with studies that address this phenomenon in peer groups outside educational settings.

Finally, this multilevel model shows that classroom factor contributes to explain to some extent participants' perceived popularity. This result suggests that some second order variables such as the average classrooms age are relevant to explain the individual variability of perceived popularity. This result suggests that each classroom can identify as a social microsystem in which both, collective properties (average classroom age) and the relational dynamics impact on adolescents' perceived popularity in school contexts.

Limitations

This research presents some limitations that must be explained for the proper interpretation of the findings shown. As previous studies suggest, it would have been desirable to offer a prior definition of the term popularity when asking the question to adolescents in the socio-centric questionnaire (Cillessen & Rose, 2005), given that meaning attributed to popularity may not be homogeneous in the sample. For some individuals, being "popular" may have a positive connotation, while others may consider it a negative trait. Secondly, as it is a cross-sectional study, this research has reported covariance relationships between variables under study, but it does not allow establishing causal relationships, so it is convenient to develop longitudinal studies to establish causal relationships. Finally, gender differences have not been examined, nor personality variables. Incorporate these variables is recommended in research dealing with perceived and sociometric popularity.

Popularity is a crucial phenomenon during adolescence whose analysis should consider the traits that define subjects from sociometric and perceived approach (Bukowski, 2011). Both types of popularity share common elements and even overlap, making

it difficult to differentiate between them, particularly in early adolescence (Bukowski & Newcomb, 1984). However, reviewed studies suggest they produce differential effects in the peer system dynamics (Cillessen & Borch, 2006). Identifying relational and contextual factors that activate each type of popularity is relevant for designing psychosocial interventions aimed at fostering interest in adolescents for developing traits typical of sociometric popularity (prosocial behaviors and helping peers), to the detriment of characteristics that usually define those individuals considered popular from the perceived approach (aggressive behaviors and giving excessive importance to physical appearance). These interventions produce changes in the perception of adolescents about what it means to be popular, and at the same time, modify the perception of reference models, substituting models that develop disruptive behaviors, for those that exhibit prosocial behaviors.

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