

Prosocial behavior and school engagement during adolescence: The mediating role of self-regulation

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ABSTRACT

During adolescence, prosocial behavior is indicative of social well-being, cognitive self-regulation skills are increasingly effective, and school engagement concerning declines. The current study investigated whether adolescents' cognitive self-regulation mediates the association between prosocial behavior toward peers and behavioral and emotional school engagement. Participants included 500 U.S. adolescents surveyed over four years (51.6% girls; 67.13% European American; T1 $M_{age} = 12.34$ years, T2 $M_{age} = 14.29$ years, T3 $M_{age} = 16.30$ years). Path analyses revealed adolescents' self-reported prosocial behavior at Time 1 positively predicted Time 2 cognitive self-regulation, and cognitive self-regulation positively predicted Time 3 behavioral and emotional school engagement. Significant indirect effects via cognitive self-regulation were found for the association between Time 1 prosocial behavior and Time 3 emotional school engagement among boys. Findings lend support to the notion that adolescents' self-regulation is an important intermediary between prosocial behavior and school engagement, at least for boys. Implications for future research and for adolescent-focused interventions are discussed.

Adolescents' school engagement has important implications for future educational and career success (Wang & Fredricks, 2014). Yet, school engagement tends to decline steadily across adolescence, especially during early-mid adolescence (i.e., 12–16 years, Engels et al., 2020; Wang & Eccles, 2012). This concerning trend has led to increased interest in the antecedents of young adolescents' school engagement (see Salmela-Aro et al., 2021 for a review). Adolescents' social behaviors are salient, intertwined with personal characteristics like self-regulation (Lerner, 2007) and academic development (Ryan & Shin, 2018), and may have applied implications for mitigating declines in school engagement (Furrer & Skinner, 2003). Based in this perspective, the present study investigated the promotive role of prosocial behavior, a specific social behavior defined as voluntary behavior intended to benefit others (Eisenberg et al., 2015), on school engagement during early-mid adolescence, and the possible mediating role of cognitive self-regulation (Fig. 1).

Prosocial behavior

Prosocial behavior is an important component of social competence and healthy social development. We focus specifically on prosocial behavior because many cultural and social groups around the world view prosocial behavior favorably (Carlo & Padilla-Walker, 2020). Prosocial behavior is also malleable through socialization and intervention (Bergin, 2018), and enables adolescents to fulfill their basic needs for autonomous action and social connection (Eccles et al., 1993). In response to the need for research on prosocial behavior that focuses on the target of the behavior (Carlo & Padilla-Walker, 2020), the present study examines adolescents' self-perceived prosocial behavior toward peers. During this stage, prosocial behavior toward peers can take many forms such as offering to help with schoolwork, providing compliments or encouragement, being kind and cooperative, or ensuring others feel included. Compared to during childhood, early-mid adolescents spend increasing time with their peers, rely on their peers more for comfort and

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advice, and give more weight to the opinions and approval from one's peers (Steinberg, 2014). Thus, peers are an increasingly important and common target of early-mid adolescents' prosocial behavior (Padilla-Walker & Carlo, 2014).

Associations between prosocial behavior and academic outcomes

Prior literature indicates that adolescents' prosocial behavior is associated with positive academic outcomes. Most of this research has focused on investigations between prosocial behavior and *achievement*, finding that when individuals behave more prosocially, they attain higher standardized achievement scores (Caprara et al., 2014; Gerbino et al., 2018; Malecki & Elliot, 2002) and academic grades (Brouwer & Engels, 2021; Caprara et al., 2000; Carlo et al., 2018; Wentzel, 1993b; Wentzel & Caldwell, 1997). Although most studies of these studies are cross-sectional, there have been a few studies that have examined associations longitudinally (e.g., Caprara et al., 2000; Gerbino et al., 2018; Vitaro et al., 2005), suggesting that prosocial behavior may have both short- and long-term academic benefits. The present study examines longitudinal associations between prosocial behavior and early-mid adolescents' school engagement, which has received comparably less attention than academic achievement. Academic achievement is related to school engagement (Ladd & Dinella, 2009), but these constructs are distinct. For example, students can be highly engaged in class (i.e., pay attention, participate, display enthusiasm), yet receive underwhelming test scores and grades (Shernoff & Schmidt, 2008). Accordingly, it is important to study the unique relation between prosocial behavior and school engagement to strengthen an understudied area of scholarship and to explore long-term protective factors against pervasive declines in adolescents' school engagement (Engels et al., 2020).

School engagement is multidimensional. In the present study, we considered two related yet discrete forms of adolescents' self-perceived school engagement: *behavioral* and *emotional engagement* (Fredricks et al., 2004). While some researchers have included additional indicators of cognitive (Wang & Eccles, 2012) or agentic engagement (Reeve & Tseng, 2011), contemporary engagement scholars have postulated that components of cognitive and agentic engagement overlap and cut across behavioral and emotional engagement (Sinatra et al., 2015). Additionally, given the person-oriented nature of the present study (Sinatra et al., 2015), and that behavioral and emotional engagement are the two most commonly studied indicators of school engagement in prior engagement research (Salmela-Aro et al., 2021), this operationalization of engagement offered a potentially significant and novel contribution to existing literature.

Behavioral engagement refers to individuals' participation in class activities such as the degree to which they pay attention, participate in class activities, contribute to class discussions, and persist when facing difficulty (Fredricks et al., 2004). Several studies have documented positive associations between prosocial tendencies and various indicators of behavioral engagement. For instance, young adolescents' reports of their desire to be helpful and friendly, an important precursor to prosocial behavior (Ryan & Shim, 2008), is associated with more self-reported effort in their English class concurrently and two years later (Wentzel, 1996) as well as increases across the school year in self-reports

and peer reports of students' effort at school (Kiefer & Ryan, 2008). Another study revealed that early adolescents' prosociality (i.e., a composite of their desire to be helpful and friendly and peer reports of prosocial behavior) was associated with greater self-reported attention in each of their classes concurrently and two years later (Wentzel et al., 2004). More research is needed to explore greater long-term relations as well as to clarify associations between prosocial behavior and comprehensive measures of behavioral engagement that capture the breadth of students' active involvement at school. Use of such measures (like in the present study) can potentially provide greater understanding of adolescents' long-term school engagement to a degree not previously understood with implications for basic science and greater nuance for applied interventions.

Emotional engagement refers to individuals' feelings toward school-work such as their level of interest and enjoyment felt during learning activities (Fredricks et al., 2004). Very few studies of which we are aware consider associations between adolescents' prosociality and emotional school engagement. Those which exist suggest adolescents' prosocial behavior toward strangers is positively associated with emotional engagement (Padilla-Walker et al., 2013) and that adolescents' desire to be prosocial predicts increased interest in school (which is a facet of emotional engagement, Wentzel, 1998). Though empirical support is limited, theoretical support for positive relations between prosocial behavior and emotional engagement can be derived from studies guided by theories of social support and self-determination theory, which document that youth within warm, helpful, and inclusive classrooms - perhaps precipitated by prosocial behavior - are more emotionally involved in the learning process (for review, see Ryan et al., 2019). Relations between prosocial behavior and emotional engagement, specifically, are in need of bolstering to increase understanding and inform applied approaches. The current study directly addresses this need.

Some studies have also examined associations between prosocial behavior and a composite measure of behavioral and emotional engagement. One study found that peer-reported prosocial behavior is associated with greater academic behaviors (i.e., a composite of individuals' perceived academic interest, independent learning, and concern with evaluation; Wentzel, 1993a). Another study found early adolescents' self-reported desire to be prosocial predicted increased interest in class (i.e., their perceived effort and attention in English class and teachers' reports of their interest in class; Wentzel, 1998).

In sum, previous research has documented positive, direct associations between adolescents' prosocial behavior and various indicators of engagement (i.e., path c in Fig. 1). However, this body of research is small, and measures often conflate desires or intentions to be prosocial with prosocial behavior or conflate various academic behaviors with school engagement. Furthermore, much of the work is cross-sectional, leaving longitudinal associations between prosocial behavior and engagement unclear. The present study addresses these limitations by examining the longitudinal associations between adolescents' prosocial behavior and well-established, comprehensive indicators of behavioral and emotional engagement (Fredricks et al., 2004).

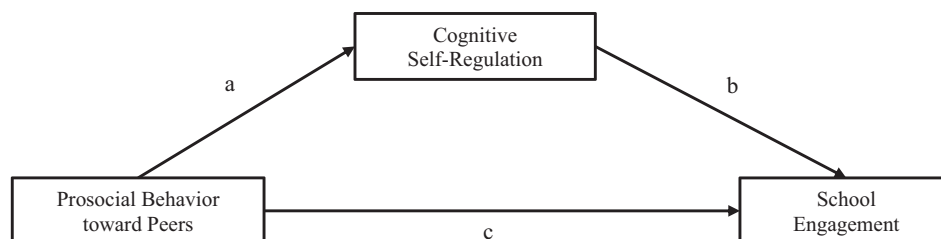


Fig. 1. Conceptual model for relations between prosocial behavior and school engagement via cognitive self-regulation.

Theoretical explanations for the link between prosocial behavior and academic outcomes

Several theoretical perspectives shed light on why prosocial behavior may lead to enhanced academic outcomes. The most common explanation is that when youth are prosocial, they tend to be more well-liked by their peers and feel more embedded in their classroom communities (Coie et al., 1990; Dirks et al., 2018). These perceptions can reduce social anxiety, freeing cognitive resources and providing confidence to fully participate in and enjoy school (Connell & Wellborn, 1991; Furrer & Skinner, 2003). In contrast, when youth are less prosocial, they are more likely to be rejected or victimized by their peers, withdraw their participation from class, and avoid their schoolwork as they experience increasing internalizing symptoms (Buhs et al., 2006). Though promising, research has shown peer relatedness is only a *partial explanation* for the association between prosocial behavior and academic outcomes (De Laet et al., 2015); thus additional mechanisms should be explored.

A less-explored yet promising explanation, from which the current study is based, is that self-regulation skills mediate the association between prosocial behavior toward peers and school engagement (Normandeau & Guay, 1998; Wentzel, 1996). For example, helping others might increase or facilitate adolescents' capacities to set and achieve goals, which could directly improve their academic outcomes. Apart from a single empirical test of this mediational relation in an early childhood sample (Normandeau & Guay, 1998), separate research has been conducted on the link between prosocial behavior and cognitive self-regulation, and on the link between self-regulation and school engagement. However, an updated test of this explanatory model is needed to confirm previous results and extend them to early-mid adolescence, when school engagement is particularly relevant (Salmela-Aro et al., 2021). To address this need, the present study investigated cognitive self-regulation as a potential mediator between prosocial behavior and engagement.

Cognitive self-regulation as a mediator

Cognitive self-regulation is a distinctive component of general self-regulation that refers to the capacity to intentionally formulate, adjust, and achieve goals across hours to years (Cleary & Zimmerman, 2012). For example, a young adolescent who sets a goal to cooperate on a class project with a difficult classmate, and who creates and acts on a plan to do so (e.g., engages in active listening, provides encouragement, fulfills responsibilities on time, etc.), demonstrates cognitive self-regulation. Cognitive self-regulation is particularly relevant to adolescents, whose neurobiological development results in greater cognitive self-regulation capacities than at any earlier point (Memmott-Elison & Moilanen, 2021).

Adolescents who behave more prosocially tend to demonstrate greater cognitive self-regulation over time (Fig. 1 - path a; Memmott-Elison et al., 2020). This is because engaging in prosocial behavior requires complex cognitive capacities and such as being cognizant of others' needs, conceptualizing effective strategies for helping, and evaluating whether help will be well-received by recipient(s) (Dunfield, 2014). Therefore, several cognitive processes that are indicative of and implicated in cognitive self-regulation are elicited during the enactment of prosocial behavior (Memmott-Elison et al., 2020). For instance, given the salience of peers during early-mid adolescence such as heightened sensitivity to peer evaluations, greater emotional investment and exaggerated rewards gained from peer relationships (Steinberg, 2014), important social goals at this stage include peer connectedness, gaining peer approval, and avoiding rejection from one's peers (LaFontana & Cillessen, 2010). When adolescents behave prosocially toward their peers as a means of fulfilling these social goals, they are also strengthening their cognitive self-regulation abilities (i.e., their ability to set and achieve goals). Adolescents' cognitive self-regulation abilities are further strengthened when they monitor and reflect on their peer

interactions to ensure they are engaging in behavior that will be well-received by others. Additionally, the highly anticipated social rewards of engaging in prosocial behavior (e.g., increased social capital; Closson & Hymel, 2016) may further encourage youth to engage in future prosocial behavior, which can trigger their cognitive self-regulatory processes for such desires to be translated into future, goal-driven behavior (Bowers et al., 2011). To this end, a recent, long-term longitudinal investigation described associations between prosocial behavior and cognitive self-regulation using the same dataset as the current study (i.e., the Flourishing Families Project) and found that prosocial behavior toward strangers and cognitive self-regulation are bidirectionally associated in early adolescence, and that prosocial behavior toward strangers promotes cognitive self-regulation throughout mid- and late adolescence (see Memmott-Elison et al., 2020). The current study builds on this investigation by focusing on peers as a unique and developmentally-relevant target of adolescents' prosocial behavior.

Furthermore, adolescents with stronger cognitive self-regulation skills tend to be more engaged in school (see Fig. 1 – path b), as supported by theory (Cleary & Zimmerman, 2012), empirical research (Rimm-Kaufman et al., 2009; Stefansson et al., 2018) and meta-analytic work (Robson et al., 2020). Typically, those with stronger cognitive self-regulation skills direct their cognitive resources toward paying attention, staying on task, understanding content, and or finding topics within the school curriculum that personally interest them, especially when spending time in the classroom. Taken together, engaging in prosocial behavior toward peers likely promotes increased cognitive self-regulation, which is in turn associated with increased school engagement among adolescents.

Possible gender differences in the relation between prosocial behavior and school engagement

Gender may be important to consider while examining how academic and social development relate over time. Girls typically engage in more prosocial behavior than boys (Eisenberg et al., 2015), beginning as early as preschool (Bierman et al., 2009) and extending through adolescence (Padilla-Walker et al., 2018; Van der Graaff et al., 2018). Despite youth engaging in varying frequencies of gender-stereotyped prosocial behaviors during childhood (Bergin et al., 2003; Carlo et al., 2003), by early adolescence girls and boys follow similar increasing trajectories of prosocial behavior toward peers (though girls may engage in higher *initial levels* of prosocial behavior toward peers than boys; Padilla-Walker et al., 2018). In addition, girls tend to report higher levels of school engagement than boys (Brass et al., 2019). It could be that being kind and or appearing invested in school are viewed as feminine qualities (Jackson & Dempster, 2009; Van der Graaff et al., 2018). If this is the case, boys may exhibit fewer prosocial behaviors and less engagement in school as they adhere to gender-based norms of masculinity and or maintain their peer status (Rogers et al., 2017; Zimmer-Gembeck et al., 2005). Aware of these possibilities, scholars have considered gender differences in the association between prosocial behavior and academic outcomes. While there are typically mean level differences favoring girls for prosocial behavior and engagement (Gerbino et al., 2018; Wentzel, 1993a; Wentzel et al., 2004), gender does not typically moderate relations between prosocial behavior and engagement. This is consistent within a larger literature that suggests that girls and boys who engage in prosocial behavior similarly benefit (Dirks et al., 2018). Since the present study takes a longitudinal approach (i.e., spanning 4 years), rather than a cross-sectional or short-term longitudinal design like previous studies, it should clarify whether gender differences occur *over time*. Thus, the present study explored whether there were main effect level differences between girls' and boys' baseline prosocial behavior, cognitive self-regulation, and school engagement, and whether gender moderated the associations between these constructs over time.

Overview of the present study

The present study builds on prior literature in five main ways. First, we explored the possibility that prosocial behavior toward peers and multidimensional school engagement are indirectly related, rather than only directly related (Carlo et al., 2018), through cognitive self-regulation. Second, while the majority of prior studies focus on relations between prosocial behavior and school engagement beginning in early childhood (Bierman et al., 2009; Nix et al., 2013), the present study extends scholarly focus to early-mid adolescence, when prosocial behavior and school engagement are especially developmentally relevant (Engels et al., 2017). Third, studies that examine the relation between prosocial behavior and school engagement often implement cross-sectional designs (e.g., Wentzel, 1993a, 1998), leaving questions regarding the continuity of this relation. The present study strengthens the literature by examining the longitudinal associations between prosocial behavior toward peers and behavioral and emotional school engagement across four-years which span early-mid adolescence (12–16 years). Fourth and fifth, the current study considers target-specific prosocial behavior (i.e., toward peers) and multidimensional school engagement (i.e., behavioral and emotional), respectively, which will provide needed nuance to the field.

Given the four-year longitudinal nature of the present study, we expected prosocial behavior would be positively, but weakly directly associated with behavioral and emotional school engagement, if direct effects were statistically significant at all (Normandeau & Guay, 1998). Rather, we expected that adolescents' prosocial behavior would promote cognitive self-regulation development, which would in turn strengthen behavioral and emotional engagement over a four-year period. We did not have specific hypotheses pertaining to whether these indirect effects might differ for behavioral versus emotional engagement given extant theory and studies. Past research suggests there may be gender differences in early-mid adolescents' reports of their prosocial behavior and engagement, favoring girls, but only a small body of work with mixed findings has examined gender differences in the direct and indirect associations between social behaviors and academic outcomes. Therefore, we expected that girls might report greater levels of prosocial behavior and school engagement. We did not have specific hypotheses as to whether direct and indirect effects between these constructs would be moderated by gender.

Method

Participants

Participants ($n = 500$, 51.6% girls) were part of the Flourishing Families Project (FFP), which is a 10-year longitudinal study with annual assessments. At the time of the first assessment (Wave 1), participants were between 10 to 13 years old. Data for the current study were taken from Wave 2 ($M_{\text{age}} = 12.34$ years), Wave 4 ($M_{\text{age}} = 14.29$ years), and Wave 6 ($M_{\text{age}} = 16.30$ years) of the FFP, which are referred to as Time 1, Time 2, and Time 3, respectively, from this point forward. These were assessment points when variables of interest were available, and participants had not yet graduated from high school.

Before the FFP was initiated, approval from the Brigham Young University Institutional Review Board (IRB) was obtained. Eligible families for the FFP were those living in a large Northwestern city in the United States, within target census tracts that mirrored the socioeconomic and ethnic/racial stratification of local school districts and included at least one child between the ages of 10 and 14 years. Regarding adolescent ethnic/racial status, 12.86% of adolescent participants were identified by their parents as African American, 4.15% as Asian American, 69.5% as European American, 1.45% as Hispanic, 11.2% as Multiethnic, and 0.83% as "Other." Nearly 60% of mothers reported having at least a bachelor's degree. Regarding combined (both partners, if applicable) annual family income, 3.63% of families made

\$10,000 or less per year, 5.44% made at least \$20,000, 9.33% made at least \$40,000, 16.06% made at least \$60,000, 16.84% made at least \$80,000, 15.8% made at least \$100,000, 11.92% made at least \$120,000, 4.66% made at least \$140,000, 4.92% made at least \$160,000, 4.4% made at least \$180,000, and 6.99% made \$200,000 or more.

Procedure

Families were primarily recruited using Polk Directories/InfoUSA, which included purchased access to a national telephone survey database. A limited number of families were also recruited using participant referrals and by placing fliers in schools ($n = 77$, 15%) so that more low-income and ethnoracially diverse participants were included in the sample. Four hundred and twenty-three of the 692 eligible families contacted agreed to participate in the FFP, resulting in a 61% response rate. Families were contacted using a multi-stage recruitment protocol. A letter of introduction was first sent to all eligible families (this step was skipped for the families who responded to fliers). Then research assistants made home visits and phone calls to confirm eligibility and willingness to participate in the project. Once eligibility, consent, and assent were established (and re-established at each sampling point.), research assistants made appointments to come to families' homes to administer questionnaire and interview assessments (only longitudinal questionnaire data were used in the current study). Families were sampled once annually for 10 years starting in 2007 (Wave 1) and ending in 2016 (Wave 10). The first 5 years of data collection occurred in-person and the final 5 years of data collection occurred online (i.e., Qualtrics surveys were sent via email). Participants were provided a monetary incentive (e.g., Amazon giftcard) following their participation in each wave. The most frequent reasons cited by families for not wanting to participate were lack of time and privacy concerns.

Measures

Prosocial behavior toward peers

At Time 1, prosocial behavior toward peers was assessed using a 9-item modified version of Peterson and Seligman's (2004) measure. Adolescents rated how representative statements were of themselves, such as "I go out of my way to cheer up my friends when they seem sad." Items used a 5-point Likert-type scale (1 = *not like me at all* to 5 = *very much like me*). Responses were coded so that higher values indicated greater prosocial behavior toward peers. This measure was reliable in the current sample at Time 1 ($\alpha = .90$).

Cognitive self-regulation

At Times 1 and 2, cognitive self-regulation capacities were assessed using a modified version of the 4-item cognitive subscale of Novak and Clayton's (2001) self-regulation measure. Adolescents' self-reported on items such as "Once I have a goal, I make a plan to reach it." Items used a 4-point Likert-type scale (1 = *never true* to 4 = *always true*). Responses were coded so that higher values indicated greater cognitive self-regulation. This measure was reliable in the current sample at Time 1 ($\alpha = .74$) and Time 2 ($\alpha = .75$).

School engagement (behavioral and emotional)

At Times 1 and 3, both the 4-item behavioral and emotional subscales from Fredricks et al. (2004) were used to measure school engagement. Adolescents rated the degree to which they agreed with statements such as "I pay attention in class" (behavioral) and "I am interested in the work at school" (emotional) using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). Responses were coded so that higher values indicated higher levels of both behavioral and

emotional school engagement. The behavioral school engagement measure was reliable in the current sample at Time 1 ($\alpha = .79$) and Time 3 ($\alpha = .78$). The emotional school engagement measure was reliable in the current sample at Time 1 ($\alpha = .75$) and Time 3 ($\alpha = .85$).

Covariates

At the initial sampling point, parents reported adolescent participants' age in years rounded to the nearest whole month (Mehmott-Elison & Moilanen, 2021). Parents also reported adolescent participants' gender as girl (coded as "0") or boy (coded as "1").

Analysis plan

Missing data

A planned missingness design (Little, 2013) was used to collect data during Time 3. Single imputation was used to fill in missing items to reduce participant burden while maintaining the quality of the data. Specifically, missing data were imputed using STATA's ICE command (Royston, 2005), which uses stochastic regression, a method preferred above other single imputation methods as studies suggest it produces parameter estimates similar to maximum likelihood and multiple imputation (Enders, 2010). At least 95.35% data or more was present for girls across study variables, while at least 92.53% data or more was present for boys across study variables (see Table 1). At Time 1, 95.6% of data were present, at Time 2 93.4% of data were present, and at Time 3 100% of data were present. To assess the nature of missing data in the current study, we used a two-step process. First, we conducted Little's missing completely at random (MCAR) test in SPSS. Since data were not MCAR, $\chi^2(15) = 26.40, p = .034$, we performed the next step, which included conducting *t*-tests to assess whether missingness is significantly associated with observed scores of primary study variables (i.e., prosocial behavior at Time 1, behavioral and emotional engagement at Times 1 and 3, cognitive self-regulation at Times 1 and 2). Participants with complete data were compared to those who were missing at least one primary study variable value or more across all Time points. The only significant difference that emerged was participants with missing data reported lower levels of behavioral engagement at Time 1, [$t(475) = 3.03, p = .003$, Cohen's $d = .28$]. Main analyses accounted for missingness using full information maximum likelihood (FIML) estimation.

Main analyses

First, using STATA/SE 17.0 and SPSS, we conducted preliminary analyses (descriptive statistics and bivariate correlations between study variables) to assess existing relations between variables. Second, using Mplus v. 8.6 software (Muthen & Muthen, 1998–2017), we conducted a

single group path model where prosocial behavior toward peers was specified as an exogenous variable, cognitive self-regulation was specified as a mediating variable, and behavioral and emotional school engagement were specified as endogenous variables. Time 1 levels of cognitive self-regulation and behavioral and emotional school engagement were controlled for along with participant age and gender. Good model fit includes a non-significant chi-square test of model fit, a CFI greater than or equal to .95, a RMSEA value equal to or smaller than .08, and an SRMR value equal to or smaller than .08 (Little, 2013). Third, we conducted a multiple group analysis to determine whether the path model varies by gender. Two separate yet identical models were specified, one for girls and one for boys. Corresponding parameters across the two models were constrained to be equal. The Wald test statistic, which is similar to the chi square difference test used in other software packages, was used to determine whether each set of constraints significantly decreased model fit. Model constraints were retained if they did not significantly decrease model fit; model constraints were removed if model fit decreased (and these parameters were allowed to vary freely). Fourth, bias-corrected bootstrap confidence intervals (CIs) were used to test the statistical significance of indirect effects.

Results

Preliminary analyses

Descriptive statistics for and bivariate correlations between variables appear in Table 1. *t*-tests were conducted to determine whether there were mean-level differences between girls and boys in prosocial behavior toward peers and in cognitive self-regulation at each Time. Cohen's d was used to calculate effect size for significant differences. Girls and boys reported similar levels of cognitive self-regulation at Time 2, [$t(464) = 1.81, p = .07$]. For all other study variables, as expected, means were higher among girls than boys. Specifically, girls reported greater prosocial behavior at Time 1, [$t(475) = 7.02, p < .001, d = .65$], cognitive self-regulation at Time 1, [$t(475) = 2.61, p = .009, d = .23$], behavioral engagement at Times 1 and 3, [Time 1: $t(475) = 4.60, p < .001, d = .41$; Time 3: $t(497) = 3.01, p = .003, d = .27$], and emotional engagement at Times 1 and 3, [Time 1: $t(475) = 3.96, p < .001, d = .35$; Time 3: $t(497) = 2.92, p = .004, d = .27$].

Cognitive self-regulation and both forms of school engagement were moderately and positively correlated with prosocial behavior within and across Times. Fisher's *r*-to-*z* transformations were conducted to determine whether there were significant differences in the magnitude of correlation coefficients between study variables for girls and boys. Correlation patterns were similar for boys and girls, except the positive association between Time 1 behavioral engagement and Time 3 behavioral engagement was significantly stronger among girls

Table 1

Descriptive statistics for and bivariate correlations between study variables for girls and boys separately.

	1.	2.	3.	4.	5.	6.	7.	8.
1. Prosocial behavior toward friends T1	–	.33***	.26***	.33***	.10	.21***	.09	–.02
2. Cognitive self-regulation T1	.29***	–	.48***	.31***	.17**	.28***	.15*	–.06
3. Cognitive self-regulation T2	.37***	.49***	–	.33***	.26***	.23***	.12 [†]	.10
4. Behavioral school engagement T1	.22***	.33***	.29***	–	.51***	.34***	.21**	–.18***
5. Behavioral school engagement T3	.18**	.13 [†]	.18**	.35***	–	.23***	.43***	–.09
6. Emotional school engagement T1	.23***	.27***	.21**	.47***	.17**	–	.35***	–.22***
7. Emotional school engagement T3	.18**	.15*	.28***	.16*	.45***	.26***	–	–.03
8. Age	.10	–.12 [†]	–.04	–.22***	–.18**	–.11	–.07	–
<i>M</i>	4.50 / 4.08	3.08 / 2.94	3.06 / 2.96	4.24 / 3.96	4.17 / 3.98	3.20 / 2.91	3.05 / 2.83	–
<i>SD</i>	0.56 / 0.74	0.55 / 0.62	0.62 / 0.57	0.63 / 0.70	0.71 / 0.70	0.78 / 0.82	0.81 / 0.87	–
<i>Range</i>	2–5 / 1.38–5	1–4 / 1–4	1–4 / 1–4	1–5 / 1–5	1.5–5 / 1–5	1–5 / 1–5	1–4.67 / 1–5	–
<i>Skewness</i>	–1.71 / –1.06	–0.55 / –0.71	–0.91 / –0.73	–1.30 / –0.70	–0.96 / –0.99	–0.07 / –0.10	–0.30 / –0.03	–
<i>N present</i>	246 / 231	246 / 231	243 / 223	246 / 231	258 / 241	246 / 231	258 / 241	–

Note. T1 = Time 1, T2 = Time 2, T3 = Time 3. Girls' coefficients are reported above the diagonal and boys' coefficients are reported below the diagonal. For descriptive information presented at the bottom of the table, girls' coefficients are before the "/" and boys' coefficients are after the "/".

[†] $p < .07$, * $p < .05$, ** $p < .01$, *** $p < .001$.

($z = -2.13, p = .03$).

Direct effects

A single-group path model was estimated and fit the data well, $\chi^2(6) = 14.84, p = .0216$, CFI = .98, RMSEA = .05 [.02, .09], SRMR = .023. Results are presented in Fig. 2. As hypothesized, greater prosocial behavior toward peers at Time 1 was associated with greater cognitive self-regulation at Time 2. Greater cognitive self-regulation at Time 2 was associated with greater behavioral and emotional school engagement at Time 3. Prosocial behavior toward peers at Time 1 was not directly associated with behavioral or emotional school engagement at Time 3. Cognitive self-regulation, behavioral, and emotional school engagement were moderately to strongly stable over time. Older adolescents reported slightly higher levels of cognitive self-regulation at Time 2. Gender was not significantly associated with cognitive self-regulation at Time 2 or behavioral or emotional school engagement at Time 3.

Group differences

The parameters of the model for girls and model for boys could not be constrained to be equal without significantly decreasing model fit, $Wald(22) = 42.79, p = .005$. Upon further investigation, most model parameters could be constrained to be equal for girls and boys except for the following four parameters: (a) the coefficient representing age at Time 1 regressed onto cognitive self-regulation at Time 2, $Wald(1) = 4.62, p = .0317$, (b) the autoregressive coefficient from behavioral school engagement from Time 1 to Time 3, $Wald(1) = 7.22, p = .0072$, (c) the coefficient representing prosocial behavior toward peers at Time 1 regressed onto behavioral school engagement at Time 3, $Wald(1) = 4.39, p = .0363$, and (d) the coefficient representing cognitive self-regulation at Time 2 regressed on emotional school engagement at Time 3, $Wald(1) = 7.21, p = .007$.

Greater prosocial behavior toward peers at Time 1 was associated with greater cognitive self-regulation at Time 2 for girls and for boys.

Greater cognitive self-regulation at Time 2 was associated with greater behavioral school engagement at Time 3 for girls and boys, and with greater emotional school engagement at Time 3 for boys, but not for girls. Cognitive self-regulation was strongly stable from Time 1 to Time 2 for girls and for boys. Behavioral school engagement was strongly stable from Time 1 to Time 2 for girls and moderately stable for boys. Emotional school engagement was moderately stable from Time 1 to Time 2 for girls and boys. Also, for boys and girls, prosocial behavior toward peers at Time 1 was not directly associated with Time 3 behavioral [boys: $\beta = .11, p = .13$ (–.036, .240); girls: $\beta = -.09, p = .119$ (–.204, .031)] or Time 3 emotional school engagement [boys: $\beta = .04, p = .546$ (–.094, .181); girls: $\beta = .01, p = .883$ (–.102, .125)]. The total effect of Time 1 prosocial behavior on Time 3 behavioral engagement was trending toward significance for boys and nonsignificant for girls [boys: $\beta = .12, p = .061$ (–.008, .241); girls: $\beta = -.08, p = .216$ (–.191, .052)]. The total effect of Time 1 prosocial behavior on Time 3 emotional engagement was also nonsignificant for boys and girls [boys: $\beta = .10, p = .145$ (–.035, .230); girls: $\beta = .01, p = .823$ (–.095, .126)]. Older girls reported higher levels of Time 2 cognitive self-regulation than younger girls. Age was not significantly associated with Time 2 cognitive self-regulation for boys. Older boys reported lower levels of Time 3 behavioral school engagement than younger boys. Age was not significantly associated with Time 2 emotional self-regulation for girls (refer to Fig. 2).

Indirect effects

Given the longitudinal design of the present study, the corresponding likelihood of small effect sizes, and despite non-significant direct effects (Hayes, 2017), we proceeded to test for indirect effects between prosocial behavior toward peers and emotional and behavioral school engagement via cognitive self-regulation. For girls, prosocial behavior toward peers at Time 1 was not indirectly associated with emotional school engagement at Time 3, $\beta = .004, p = .667$ [–.01, .031], or with behavioral school engagement at Time 3, $\beta = .02, p = .209$ [–.001, .059], via cognitive self-regulation at Time 2. For boys, prosocial

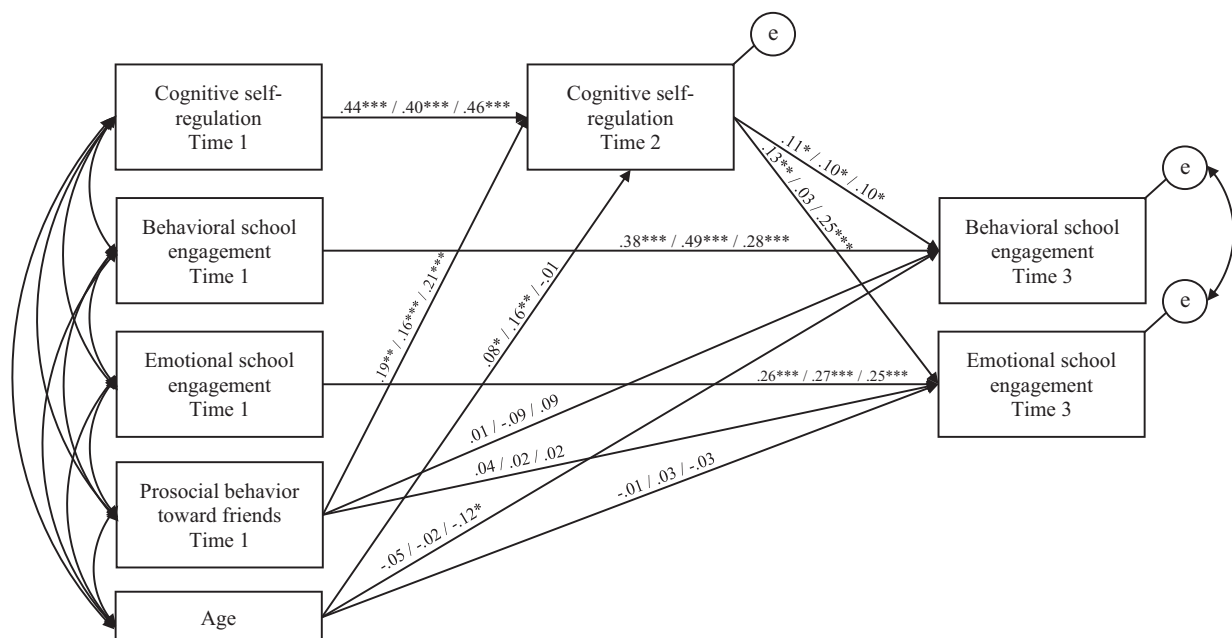


Fig. 2. Standardized, direct relations between adolescents' prosocial behavior toward peers, cognitive self-regulation, and behavioral and emotional school engagement for girls and boys combined and separately, respectively. Note. Coefficients from the single-group model are reported first, coefficients for girls are reported between slashes, and coefficients for boys are reported third. Gender was a covariate in the single group model but is not depicted because it was the grouping variable for the multiple group analysis. Exogenous variable correlation values and endogenous error correlation values are not depicted for parsimony. * $p < .05$, ** $p < .01$, *** $p < .001$.

behavior toward peers at Time 1 was indirectly associated with emotional school engagement at Time 3 via cognitive self-regulation at Time 2, $\beta = .06$, $p = .032$ [.018, .124]. Also, for boys, prosocial behavior toward peers at Time 1 was not indirectly associated with behavioral school engagement at Time 3 via cognitive self-regulation at Time 2, $\beta = .01$, $p = .59$ [−.023, .065]. There were significant differences between girls and boys in the indirect effect from prosocial behavior toward peers to cognitive self-regulation to emotional school engagement, $Wald(1) = 5.36$, $p = .0206$.

Discussion

Researchers have long recognized the interrelated nature of academic and social development during adolescence (Ryan & Shin, 2018). Much attention has been put toward identifying the social contexts that promote healthy academic trajectories, especially since school engagement and motivation tend to decline across early-to-mid adolescence (Eccles et al., 1993; Engels et al., 2019). The present study contributes to a growing literature by investigating longitudinal relations between adolescents' prosocial behavior toward peers, cognitive self-regulation, and behavioral and emotional school engagement over a four-year period. Most prior research investigates the association between general prosocial behavior and unidimensional school engagement using early childhood samples (Nix et al., 2013; Welsh et al., 2001) and cross-sectional designs (Wentzel, 1993a). Therefore, the current study provides several novel contributions that have both scientific and practical significance.

Direct effects between prosocial behavior, cognitive self-regulation, and school engagement

Overall, hypotheses regarding direct effects were supported. To date, this represents the longest time span of an analysis prosocial behavior and school engagement among adolescents. Prosocial behavior toward peers positively predicted cognitive self-regulation two years later (Fig. 1 – path a) and cognitive self-regulation positively predicted behavioral and emotional school engagement another two years later (Fig. 1 – path b). Direct effects were consistent for girls and boys, which aligns with prior research (Wentzel et al., 2004). Our results lend support to the notion that prosocial behavior directly enhances adolescents' cognitive regulation skills through use over time (Memmott-Elison et al., 2020). Findings also lend support to the notion that prosocial behavior toward peers specifically is particularly relevant for strengthening adolescents' cognitive self-regulation skills, perhaps because peers take on such an important role during this stage (Steinberg, 2014). Further, our findings suggest that boys and girls can then use their enhanced cognitive self-regulation skills to actively contribute, pay attention (i.e., behaviorally engage), and for boys, to develop interest and enjoyment (i.e., emotionally engage) in their classes (Rimm-Kaufman et al., 2009). We should note that prior studies find that cognitive self-regulation predicts prosocial behavior (Memmott-Elison et al., 2020). Therefore, further research is needed to clarify relations between cognitive self-regulation and prosocial behavior over time, and whether and how these might interact to support students' engagement.

Prosocial behavior toward peers at Time 1 did not directly predict behavioral or emotional engagement at Time 3 (Fig. 1 – path c). Though consistent with one past study (Normandeau & Guay, 1998), the lack of direct findings may, in part, reflect the long duration between measurement points in the current study. That is, across four years, students typically experience changes in the makeup of their friend and peer groups (Barber & Olsen, 2004) due to shifting academic and social priorities that were unmeasured in the current study (e.g., greater desire to make friends, avoidance of schoolwork; Juvonen & Murdock, 1995). Accordingly, adolescents' prosocial behavior might not be targeted toward consistent peer targets over time, and there could be individual differences in the variability of adolescents' school engagement that

contribute to the non-significant direct effects found in this study. Researchers should explore these possibilities. It could also be that non-significant direct effects between prosocial behavior and school engagement pertain to use of a global measure of prosocial behavior in the present study. Studies that take a multidimensional approach to measuring prosocial behavior find that direct prosocial behaviors (i.e., helping in emergency contexts) and compliant prosocial behaviors (i.e., helping when asked) are related to adolescents' academic achievement, whereas emotional prosocial behaviors (i.e., helping in emotionally salient contexts) are not (Carlo et al., 2018). Future research should incorporate more nuance into their studies by considering how different dimensions of prosocial behavior, specifically those targeted to peers, relate to adolescents' school engagement.

Indirect effects via cognitive self-regulation

Cognitive self-regulation partially mediated the association between prosocial behavior toward peers and emotional school engagement (but not behavioral engagement) across four years among boys. Prior work has found that adolescents' cognitive self-regulation predicts prosocial behavior toward strangers (Memmott-Elison et al., 2020), so the present study importantly extends these findings to peer-targeted prosocial behavior (Steinberg, 2014). The protective effects of prosocial behavior appear to occur at a cognitive level, and then extend to the academic domain. Prosocial behavior can be an important means to gain acceptance into the peer group, which is an important priority for youth during early-to-mid adolescence (LaFontana & Cillessen, 2010). Perhaps as youth work toward peer acceptance, they are especially mindful and planful for future prosocial interactions, and in doing so, strengthen their cognitive self-regulation abilities. Youth who have strong goal-setting, monitoring, and planning abilities are known to apply these skills to academics, and therefore tend to be more engaged in school (Rimm-Kaufman et al., 2009).

Gender differences in indirect effects

We found main effect level differences between girls and boys for prosocial behavior and school engagement favoring girls, which is consistent with prior studies (e.g., Carlo et al., 2003; Engels et al., 2020). Given that past studies generally find similar patterns of associations between social and academic outcomes for girls and boys (Dirks et al., 2018), it was interesting that we found significant indirect effects for boys but not for girls. Based on means in the present sample, emotional engagement declined for both boys and girls over time, but more so for girls. In terms of developmental context, this could be because school transitions (some of which were likely to occur during the duration of the current study) are especially disruptive for girls (Simmons & Blyth, 1987) due to girls' heightened sensitivity to co-occurring biological, emotional, and especially social changes. Therefore, it is possible that girls' emotional engagement (i.e., their level of interest in and enjoyment of their classes) are anteceded by stress more so than cognitive self-regulation skills. To move the field forward, additional longitudinal research on adolescents is needed to replicate these findings. Future research investigating prosocial behavior and engagement should also consider examining self-regulation simultaneously with other potential mechanisms, such as relatedness (Furrer & Skinner, 2003), to investigate relative and interactive contributions for girls and boys.

Multidimensional school engagement findings

Through cognitive self-regulation, prosocial behavior was indirectly related to emotional school engagement but not to behavioral school engagement (among boys). One explanation for these findings is that when students enhance their prosocial behavior and their cognitive self-regulation abilities, they may first experience an emotional change in school before they experience a behavioral change (Wang & Degol,

2014). For instance, when adolescents are more goal-oriented, they may be better able to invest their energy in enjoying their classes and finding meaningful, personal connections within the subject material that interests them. It has been suggested that these positive feelings (i.e., emotional engagement) must occur before youth put effort toward their schoolwork and participation (i.e., behavioral engagement; Wang & Degol, 2014), though more research is needed to clarify the different antecedents and outcomes of the different dimensions of engagement. This finding highlights the importance of using multidimensional school engagement (Fredricks et al., 2004; Wang & Eccles, 2012), since divergent findings were found for the different subtypes of engagement. Most prior work has examined the associations between prosocial behavior and indicators of facets of behavioral engagement like effort and attention (e.g., Wentzel, 1993a) or a combination of behavioral and emotional engagement (e.g., Wentzel, 1998), so the present findings add novel information about the importance of cognitive self-regulation for youth's emotional engagement.

Study limitations

The results of the present study should be interpreted in light of several limitations. For instance, the sample was fairly advantaged, in which the majority of participants were European American, had college-educated mothers, and came from middle to high income households. Therefore, findings should be interpreted and applied carefully. Future work should replicate the present findings in more socioeconomically and ethn racially diverse samples, especially among samples of disadvantaged youth who have unique lived experiences. Moreover, the measures used in this study were self-reported by adolescent participants (although demographics were reported by parents) which presents concerns of inflation of results due to shared method variance. The small magnitude of effects found in the current study, though likely due to the long duration of the present study, warrant future replication research. Further, though self-report is considered a useful and reliable method of measurement for constructs like self-regulation and school engagement (Wang & Degol, 2014), information from other reporters such as teachers and peers could provide another important perspective (Dirks et al., 2018) in future studies. Another important direction for future study that warrants attention includes the consideration of relations between prosocial behavior, self-regulation, and school engagement across varying periods of time (i.e., measurement lags) and bidirectionally. This is because changes in school engagement may occur each year, within a school year, and or across different school subjects (Fredricks et al., 2004). It is also possible that emotional engagement may precipitate changes in behavioral engagement (Wang & Degol, 2014). Thus, accounting for the temporal consistency and directionality of relations between constructs could further strengthen the literature and clarify current and extant findings.

Implications for applied science

The present study's findings have interesting and important insights for school-based interventions that aim to increase adolescents' school engagement. For instance, current findings confirm that providing adolescents with opportunities to be prosocial toward peers and to practice their cognitive self-regulation skills are fruitful avenues for not only tempering concerning declines in school engagement (Wang & Eccles, 2012), but also for increasing school engagement (Caprara et al., 2014). Importantly, youth's prosocial behavior has been found to be malleable in school settings (Domitrovich et al., 2017). That is, students can learn how to be more prosocial through direct instruction and practice. Social-emotional learning (SEL) programs, which seek to foster social and emotional competencies such as managing emotions, expressing empathy, establishing and maintaining healthy relationships, cooperating with others, and working toward positive personal goals (Mahoney et al., 2021), may be well-suited to build K-12 students' prosocial skills.

SEL programs are increasingly common in schools and have been shown to have academic and social benefits for students across socioeconomic status and racial groups (Taylor et al., 2017). Additionally, mindfulness-based interventions are increasingly popular in schools, and hold promise for improving youths' prosocial behavior and self-regulation simultaneously (Berti & Cigala, 2022). Future research should explore whether these interventions have direct or indirect positive effects on students' engagement, particularly among high school aged samples (Galla et al., 2020), and whether gender differences exist.

Conclusions

The present study lends support to the notion that boy adolescents' prosocial behavior toward peers is positively associated with later behavioral and emotional school engagement though cognitive self-regulation. Although much prior work has examined prosocial behavior's effect on adolescents' academic achievement, less work had considered effects on school engagement. Yet, the degree to which students engage, or actively participate and enjoy their classes, has significant implications for their later educational success and attainment (Wang & Fredricks, 2014). This study represents one of the first attempts to test whether the association between adolescents' prosocial behavior and school engagement can be explained by cognitive self-regulation skills (Wentzel, 1996). We found a mediational relationship for boys, but not girls. Looking to the future, there is a need for more nuanced investigations to elucidate these processes with particular attention toward confirming and explaining potential gender differences.

Data availability

The datasets analyzed in the current study are not publicly available but are available from the corresponding author on reasonable request.

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