This is the submitted version of the following article: Halbreich, E. D., Lancaster, B., Littlefield, A. K., & Van Allen, J. (2026). Examining the relationship between pet ownership and prosocial behaviors among early adolescents. Journal of Adolescence 0: 1–14, which has been published in final form at https://doi.org/10.1002/jad.70225.

Examining the Relationship Between Pet Ownership and Prosocial Behaviors Among Early Adolescents

Author Note

Word Count: 5,521

Abstract

Introduction. Prior literature within the field of human-animal interaction has illuminated the potential impact of companion animals on prosocial behaviors. This study explores pet ownership association with both adolescent self-reported and parent-reported adolescent engagement in prosocial behavior, using a large dataset of adolescents in the United States, collected between the years of 2019–2022.

Methods. This study analyzes secondary data from the longitudinal ABCD Study®. The final analytic sample includes 8,504 adolescents (53.4% boys) with an average age of 12.46 (*SD* = 0.68) at Time 1 and 13.6 (*SD* = 0.73) at Time 2. Ordinal logistic regressions were estimated within a structural equation modeling framework to evaluate if pet ownership type (e.g., dog owners, cat owners) was associated with increased odds of parent- and adolescent-reported engagement in prosocial behaviors as measured by an adapted subscale from the Strengths and Difficulties Questionnaire controlling for age and gender.

Results. The parent-report adolescent prosocial latent variable indicated no significant effect of pet ownership. The adolescent self-report prosocial latent variable revealed that adolescents in dog-owning and mixed-pet (e.g., cats and dogs) households had greater odds of agreeing that they engage in prosocial behavior compared to adolescents in non-pet households. There was a significant interaction between pet ownership and gender, with girls in mixed-pet household having greater odds of reporting prosocial behavior compared to boys in non-pet households. Repeated-measures analysis demonstrated relative stability between the Time 1 and Time 2 waves in terms of broad within-group responses to prosocial behavior items.

Conclusions. This research highlights differences between types of pet-owning families in terms of reported engagement in prosocial behaviors.

Keywords: human-animal interaction, prosocial behavior, developmental science, adolescence

Introduction

Human-animal interaction (HAI) has been proposed as a potentially underexplored but important piece of positive youth development (Mueller, 2014). This is especially salient given that approximately 61% of United States families own a pet, with even higher rates among households with children (Applebaum et al., 2023). Prosocial behavior, defined as performing voluntary behaviors that benefit others (Eisenberg & Mussen, 1989), has been identified as a core component of positive youth development (Lam, 2012; Meulenbeek et al., 2026) predictive of improved peer relationships (Caputi et al., 2012), improved academic performance (Cruz et al., 2025), and decreased behavior problems (Chen et al., 2019). HAI has been proposed as a potential facilitator of prosocial behavior development for youth with some preliminary intervention research suggesting increased prosocial behaviors when a pet has been introduced in the classroom (McCullough et al., 2021) or utilized in therapy for autism spectrum disorder (Kilmer et al., 2024). However, it is currently unclear whether pet ownership, specifically, is beneficial for a typically developing youth's prosocial behavior development.

Prosocial behavior contains a number of different components, with distinctions generally being drawn between emphasis on intentions, consequences, and societal context (Pfattheicher et al., 2022). Prosocial behavior in this study is assessed via adapted items from the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; Goodman et al., 1998) which has items drawn primarily from an intentionalist perspective. Prosocial behavior can be framed within a multilevel perspective (Penner et al., 2005), such as the bioecological model of human development (Bates et al., 2023; Bronfenbrenner & Morris, 2006). Within the mesosystem (i.e., family household environment), many factors may impact an individual's development of prosocial behavior engagement. For example, parental behaviors such as higher levels of warmth

and positive control and lower levels of harsh parenting were associated with higher levels of prosocial behavior in a recent meta-analysis (van der Storm et al., 2022). Similarly, Yoo et al. (2013) found in a longitudinal study that adolescent prosocial behavior at year 5 was positively associated with baseline parental solicitation (about the activities, friends, and whereabouts of the adolescent) and perceived balanced connectedness (i.e., closeness and respect for autonomy) with parents at year 4.

Early adolescence is a period of development during which there are a number of changes that implicate prosocial behavior engagement (e.g., the onset of puberty, increased perspective taking). Prosocial development may be shaped by individual characteristics (e.g., empathic concern, prosocial cognitions) and environmental influences, such as exposure to music with prosocial lyrical content; for example, prosocial songs have been shown to increase empathic concern, which is positively associated with prosocial behavior engagement (Liang et al., 2025).

Additionally, prosocial behavior has been shown to differ across genders, with girls reporting greater prosocial behavior engagement compared to boys (e.g., Carlo et al., 2007; Van Der Graaff et al., 2018). The impact of age on prosocial behavior is somewhat unclear, as effects generally differ depending on the specific type of behavior assessed as well as the social context of the behavior (Brittian & Humphries, 2015; Crone & Achterberg, 2022; Güroğlu et al., 2014). Within the HAI literature, it has been theorized that pets may impact engagement in prosocial behavior through taking responsibility of pets to whom youth feel a strong emotional bond (Vidović et al., 1999) and fostering salience of the value of contributing to others within their social context (Mueller, 2014). Other mechanisms for the relationship between HAI and prosocial behavior have been proposed, such as biological mechanisms, experiential learning, and that having pets fosters social interactions (for a review of these mechanisms, see Chen et

al., 2024). Because pets are nested within the family mesosystem, they are implicated in the ongoing developmental processes of the individual. For example, a young adolescent may begin to take on additional care responsibilities for their pet, perhaps facilitated by parents attempting to foster autonomy. There is a lack of clarity in the literature related to any potential causal mechanisms (i.e., does having a pet increase prosocial behavior, or does a proclivity for engaging in prosocial behaviors increase odds for wanting to care for a pet), which could be explored through future longitudinal research and research examining relationship-level variables within an adolescent's mesosystem.

Research within the field of HAI has evaluated the association between pet ownership (i.e., type of pet owned) and prosocial behaviors; however, current evidence is mixed. Several studies have found no impact of ownership alone on prosocial behavior. One study, focusing primarily on dyadic conversations between 123 parent and youth dyads in the presence or absence of a dog, found no differences between pet-owning and non-pet-owning groups on reported prosocial behaviors (Reider et al., 2023). [REDACTED FOR REVIEW] conducted a person-centered analysis of ABCD Study® data using data from approximately half of the 3-year follow-up sample (n = 5,218). The authors conducted a latent profile analysis with several peer behaviors, including youth-reported prosocial behavior. Analyses did not reveal notable differences in prosocial behavior by pet ownership status. However, prosocial behavior was not independently investigated in these analyses. Further, the prosocial behavior items were combined into a single score to accommodate the latent profile analysis, warranting a more granular investigation into the data focusing specifically on prosocial behaviors. Findings from Jacobson and Chang (2018) investigated if contextual factors (e.g., attitude towards pets) may play a role beyond measuring pet ownership alone among 342 American youth aged 8–19. They

found that attitudes toward pets and female child gender were significant predictors of caregiver-reported engagement in prosocial behavior, but pet ownership alone was not a significant predictor.

Other studies have found that pet ownership alone may impact prosocial behavior. Using data from nearly 8,000 Australian school-aged children, Christian et al. (2020) found that, compared to non-pet owning families, pet owners (any pet, dog, cat, and other pet owners) had lower odds of reporting abnormal scores on the prosocial behavior subscale of the SDQ, controlling for various contextual covariates (e.g., family structure, household income, education level). Wenden et al. (2021) conducted a secondary data analysis on 1,646 Australian parents and found that, controlling for "child age, sex, sleep and screen time, and parent education" (p. 1016), children from dog-owning families had 1.34 greater odds of reporting above average prosocial behaviors, compared to children from non-dog-owning families. Christian et al. (2020) did not adjust for age and sex of the child and Purewal et al.'s (2024) regression tables did not include the estimates for included covariates (N = ~14,000 [dependent on analysis]); however, Wenden et al.'s (2021) analyses show that age and gender are associated with reported engagement in prosocial behaviors (older children and girls—compared to boys—having greater odds of being above average on prosocial behavior).

A recent systematic review on pets and youth development has highlighted a need for high quality, longitudinal studies to more comprehensively explore outcomes of interest (Purewal et al., 2017). Christian et al. (2020) investigated between group longitudinal relationships between ages 4–6 (n = 4,242) and then 6–7 (n = 4,431) and concluded that, controlling for the same contextual covariates, that dog-owning children and other pet-owning children (children who have pets other than dogs or cats) had higher prosocial behavior scores, compared to non-

pet-owning families. However, these findings should be appropriately contextualized, as the authors note that, depending on the subscale, between "2.4% and 10.7%" (Christian et al., 2020, p. 202) of children were categorized as having abnormal scores on the SDQ, indicating that these analyses may have produced unstable estimates and standard errors due to cell sparseness.

Gaps in Current Literature

There is considerable variability in the HAI field (Rodriguez et al., 2021), which investigates complex dyadic relationship factors. It is important within developmental research to properly account for factors such as age and gender, but these variables have been neglected in some of current HAI literature and thus warrant proper examination in the context of this relationship. Further, much of the research in the domain of prosocial behavior and HAI has been conducted in countries other than the United States (e.g., Australia, the United Kingdom, Croatia), using demographically homogenous samples, and generally focusing on younger participants. Previous research has demonstrated that relationships with pets as well as certain aspects of prosocial behavior differ significantly across cultures (e.g., Gray & Young, 2011; Gustafsson et al., 2020; House et al., 2013), pointing to the importance of investigating relationships within different cultural contexts. Additionally, current research often lacks a granular investigation of differences between types of pets owned. Therefore, it is important to investigate the relationship between pet ownership and prosocial behaviors in a large, diverse dataset focusing on adolescents in the United States.

Study Aims

Utilizing data from the Adolescent Brain Cognitive Development (ABCD) Study®, a large socio-demographically diverse data set of early adolescents in the United States (Garavan et al., 2018; Saragosa-Harris et al., 2022), this study aims primarily to evaluate the relationship

between pet ownership (i.e., type of pet owned) and parent- and adolescent-reported adolescent engagement in prosocial behavior, measured using an adapted version of the SDQ (Aim 1). Based on recent literature (i.e., [REDACTED FOR REVIEW]), we hypothesize that there will be no differences in parent- and adolescent-reported adolescent engagement in prosocial behavior when comparing non-pet owners to different types of pet owners and adjusting for covariates. Although this research does not hypothesize a relationship among study variables, given previous mixed research, it is worth clarifying the specific relationship between various types of pet ownership and prosocial behavior within a large, demographically diverse dataset of adolescents living in the United States. Additionally, given the limited previous longitudinal research, this study aims to describe changes in prosocial behavior and pet-ownership status during this period of adolescence to support future longitudinal research. Thus, Aim 2 will explore within-group changes in adolescent prosocial behavior and pet ownership status for participants over a one-year time period. Aim 2 is exploratory, with no hypothesized direction or anticipated change between time points.

Materials and Methods

Participants & Procedures

This research used data from the ABCD Study®, a longitudinal study of brain development and adolescent health outcomes in the United States. The data collection procedures are well documented as part of the larger ABCD Study®, https://abcdstudy.org/scientists/protocols/. This study analyzed data from the entire ABCD cohort (N = 11,878) except for twelve participants who withdrew consent to share their data as of the ABCD Annual Curated Release 5.1 (DOI: 10.15154/z563-zd24). As noted by Saragosa-Harris et al. (2022), siblings and twins were oversampled in study recruitment, and so to avoid violating

the assumption of independence of observations, only the initially enrolled participants were retained in the analytic sample. Additionally, participants with obvious data entry errors (e.g., incorrect site ID, impossible age) were removed. These considerations bring the total analytic sample to 8,504.This study examined data from the 3-year (Time 1; n = 8,504) follow-up for the cross-sectional analysis and 3- and 4-year (Time 2; n = 3,979) follow-ups for the longitudinal data analyses.

Ethical Guidelines and Review

ABCD research sites rely on a central Institutional Review Board (cIRB) at the University of California, San Diego for the ethical review and approval of the research protocol, with some sites obtaining local IRB approval (Auchter et al., 2018). Parent participants provided consent and adolescent participants provided assent (Clark et al., 2018).

Pet Ownership

Pet ownership type has been defined by combining participants into the following groups: participants who report having no pets (n = 2,052; 24.1%), only dogs (n = 2,434; 28.6%), only cats (n = 862; 10.1%), only other pets (n = 585; 6.9%), and those that have non-mutually exclusive pet ownership (i.e., owns multiple types of any pet, such as owning both cats and dogs or owning a cat and a fish; n = 2,571; 30.2%). Among this non-mutually exclusive pet group, 91% owned dogs and 67% owned cats. Regarding changes between waves, 671 participants had no pet at either point, 272 went from no pet to having a pet, 132 went from having a pet to no pet, and 2,840 had a pet at both points.

Demographics

Demographic variables were reported by parents (adolescent age) and adolescents (adolescent gender). The mean adolescent age was 12.46 (SD = 0.68) at Time 1 and 13.6 (SD =

0.73) at Time 2). Boys were slightly over-represented, with 4,465 boys (53.4%), 3,711 (44.4%) girls, and 182 children identifying with another gender (2.2%). Due to cell sparseness, identifying with another gender were not included in the regression analyses. At Time 2, there were 2,079 boys (52.3%) and 1,743 girls (43.8%). Pet ownership at Time 1 differs slightly by child gender ($\chi^2[4] = 25$, $p < .001$), with boys being overrepresented in non-pet ownership (Number of boys in category: 1153/Number of girls in category: 842; std. residual = 3.28), dog ownership (1322/1030; std. residual = 1.84), and cat ownership (443/363; std. residual = 0.21), and girls being overrepresented in other pet (274/286; std. residual = 1.74) as well as mixed-group (1202/1261; std. residual = 4.07) pet ownership.

Missingness

Missing data were estimated using multiple imputation (10 datasets), as overall rates of missingness across variables were low (< 4%; **Table 1**), and estimation of missing data is recommended (Graham, 2009). Nominal variables were specified as auxiliary variables during imputation, as Mplus is currently unable to impute nominal variables.

Measures

Prosocial Behavior

Adolescent- and parent-report versions of an adapted Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; Goodman et al., 1998). The adolescent-report items (3-item scale) ask adolescents to report how true statements presented to them are in the last six months, with the items being rated on a 3-point Likert-type scale including 0 (*Not True*), 1 (*Somewhat True*), and 2 (*Certainly True*). The primary modification to the original SDQ made by the ABCD Study® team was removing two items; specifically: “I usually share with others” and “I am kind to younger children.” There were also slight wording changes instituted, specifically,

changing “ill” to “sick” for item 2 (youth report) and changing “volunteer” to “offer” for item 3 (youth and parent report). The adolescent items are as follows: “I try to be nice to other people. I care about their feelings” (Adolescent Prosocial 1); “I am helpful if someone is hurt, upset, or feeling sick” (Adolescent Prosocial 2); and “I often offer to help others (parents, teachers, children)” (Adolescent Prosocial 3). The parent-report items (3-item scale) ask parents to respond “on the basis of the child's behavior over the last six months or this school year” and are rated on the same 3-point scale. The parent items are as follows: “My child is… Considerate of other people's feelings” (Parent Prosocial 1); “My child is… Helpful if someone is hurt, upset, or feeling ill” (Parent Prosocial 2); and “My child is… Often offers to help others (parents, teachers, other children)” (Parent Prosocial 3). Response rates are reported in **Table 2**. Because the proportional odds assumption was met (described in the *Data Analysis* section), the prosocial items (specifically *Not True* and *Somewhat True*) were temporarily collapsed into dichotomous response categories in order to test internal reliability using the Kuder-Richardson Formula 20 (KR-20; Kuder & Richardson, 1937). The KR-20 found a discrepancy in reliability between parent (.793) and youth (.603) measure reliability. The KR-20 results are similar to treating responses as continuous data and calculating raw alpha (parent-report $\alpha = .81$; adolescent-report $\alpha = .62$).

Pet Ownership

The Pet Ownership survey is an adolescent-report measure of pet ownership developed by the ABCD Study® team. Adolescents were asked if they “currently have any pets” and told to “select all the pets that you currently have.” They could respond with multiple selections among the following options: dog; cat; horse; fish; other small animal (e.g., rabbit, hamster, bird); other.

Data Analysis

Data analyses and management were conducted in R version 4.2.3 (R Core Team, 2023), Mplus version 8.11 (Muthén & Muthén, 1998–2017), and SAS Studio software version 3.82 (Copyright © 2012-2023, SAS Institute Inc., Cary, NC, USA.). Ordinal logistic regressions within a structural equation modeling framework were utilized to test the hypotheses that pet ownership type (e.g., dog owners, cat owners) would be associated with increased odds of parent- and adolescent-reported engagement in prosocial behaviors, controlling for age and gender. For ease of interpretation, age was mean centered in the regression analyses. Ordinal logistic regressions were utilized due to prosocial behaviors being measured on an ordinal Likert-type scale. Because the prosocial items measure the same latent variable, the regression models were run by treating parent- and adolescent-reported prosociality as latent variables being predicted by pet ownership, gender, and age. Analyses are reported with no predictors in the model (non-predictor), just the pet ownership variables (non-covariate), with gender and age included (covariate), and with interactions between significant covariates and pet ownership (covariate interaction). As discussed by Agresti (2013), the cumulative logit model used in ordinal logistic regression assumes proportional odds. To test proportional odds, each item was modeled as an individual outcome variable and the Brant test (Brant, 1990) was used to examine overall misfit of the assumption. Results in **Table 3** indicated that ordinal logistic regression was an appropriate analytical strategy. For Aim 2, response category selection change was examined between Time 1 and Time 2 using symmetry, quasi-symmetry, and marginal homogeneity of the distributions of the square contingency tables for each item. These techniques were used in lieu of latent growth modeling (for example) due to the pet ownership variable being limited to two time points, which does not allow for examination of the shape of any growth trajectory, given that any change being limited to straight lines between points (Duncan & Duncan, 2009).

Sensitivity testing was also conducted, both treating the prosocial items as individual ordinal outcome variables and by summing items for adolescent and parent reports of prosocial behavior (parent- and adolescent-report prosocial mean scores by pet group are reported in **Table 4**). Additionally, different groupings of pet ownership were tested (i.e., dichotomous pet/non-pet; non-exclusive pet categories). These alternative analyses were conducted to help contextualize the findings and additionally examine any differences in broad interpretation of the results across methodologies.

Results

The prosocial behavior factor structure and ordinal logistic regression analyses are estimated based on participants at Time 1.

Prosocial Behavior Factor Structure

The factor structure of the items is shown in **Figure 1**. The parent- and adolescent-report factors correlate .30, which aligns with findings reported by Goodman et al. (1998), who found a .31 correlation between parent- and adolescent-report scores in a community sample on the prosocial behavior subscale.

Ordinal Logistic Regression Analyses

To explore the hypothesis that there will be no differences in parent- and adolescent-reported adolescent engagement in prosocial behavior when comparing non-pet owners to different types of pet owners and adjusting for covariates, this study performed ordinal logistic regression analyses using Time 1 data and the latent prosociality variables. The results of the ordinal logistic regression are in **Table 5–Table 6**. To evaluate model fit between the different models (i.e., non-predictor, non-covariate, covariate, covariate interaction) for each outcome, Akaike information criterion (AIC), Bayesian information criterion (BIC), and log-likelihood

were examined (**Table 7**). AIC, BIC, and log-likelihood estimates were examined holistically (values closer to 0 indicate better fit). For adolescent-report models, the covariate model had the lowest BIC, and the covariate interaction model had marginally lower AIC and log-likelihood. For parent-report models, the covariate model had the lowest AIC, BIC, and log-likelihood. It should be noted that the inclusion of the pet variables for both parent- and adolescent-report models very slightly improved (for AIC and log-likelihood) or worsened (for BIC) model fit.

Results indicate that there are differences between parent- and adolescent-reported prosocial behavior at Time 1. In adolescent-report non-covariate models, compared to adolescents in non-pet owning families, adolescents who owned only dogs (*OR* = 1.11) as well as multiple types of pets (*OR* = 1.14) had greater odds of reporting engagement in prosocial behaviors. When including covariates, child age was not a significant predictor, but child gender was. Specifically, compared to boys, controlling for age and pet type, girls had greater odds of engagement in prosocial behavior (*AOR* = 1.52). When including demographic covariates, pet type remained significant, and so interactions between pet type and gender were probed. Girls in families with multiple types of pets had greater odds of prosocial behavior, compared to boys with no pets (*AOR* = 1.22). Although girls who owned only dogs descriptively reported greater odds of prosocial behavior engagement (*AOR* = 1.18), the adjusted odds ratio was not statistically significant ($p = .050$). In parent-report models, pet ownership grouping was not associated with significant change in odds with respect to adolescent prosocial behavior, but, controlling for pet group and age, parents reported that girls had greater odds of engaging in prosocial behavior, compared to boys (*AOR* = 1.35).

Repeated-Measures Analyses

Aim 2 focused on exploring within-group changes in adolescent prosocial behavior and pet ownership status for participants over a one-year time period without a specific hypothesis posited. These analyses are intended to be descriptive and exploratory, primarily serving to investigate change in reporting over a one-year period and inform future research once additional ABCD Study® waves have been collected using additional analytic techniques (e.g., latent growth modeling). To examine if reporting of prosocial behaviors changed over time, response rates for Time 1 and Time 2 were examined. Specifically, symmetry, quasi-symmetry, and marginal homogeneity of the distributions of the square contingency tables were compared for each item (Agresti, 2013, p. 426). For all these statistics, stability in response categories fall on the diagonal, and change is indicated on the off-diagonal, with these techniques quantifying if there is some directionality, either in the off-diagonal cells (in the case of symmetry and quasi-symmetry) or in the marginal totals (in the case of marginal homogeneity). For example, if there was no change in prosocial response category selection between Time 1 and Time 2, the contingency tables in **Table 8** would only have observations on the diagonals. Symmetry tests for complete agreement between years, wherein the matrix is symmetrical, although it "rarely fits well" (Agresti, 2013, p. 427) because it is very restrictive. Quasi-symmetry does not require marginal homogeneity (i.e., the row and column distributions to be the same) and so is less restrictive and has greater applicability compared to symmetry. Further, a test of marginal homogeneity was conducted by comparing the fit statistics for the symmetry and quasi-symmetry models. Square contingency tables are in **Table 8** and fit statistics of symmetry, quasi-symmetry, and marginal homogeneity are in **Table 9**. These analyses indicate that for all items, quasi-symmetry is a reasonable fit for the data, and that symmetry and marginal homogeneity are reasonable fits for the data for Parent Prosocial 1 and 2. These analyses indicate that, while there

are some changes in parent- and adolescent-reported prosocial behaviors between the three- and four-year follow-ups, the reported behaviors generally agree between waves. For illustrative purposes, we created sum-scores of each prosocial scale and conducted dependent-means *t*-tests. Adolescents at Time 1 had a mean score of 5.06 (*SD* = 1.2) and a mean of 4.99 (*SD* = 1.15) at Time 2, $t(3978) = 3.3$, $p < .001$, Cohen's $d = .06$. Parents reported at Time 1 had a mean score of 4.95 (*SD* = 1.5) and a mean of 4.93 (*SD* = 1.19) at Time 2, $t(3978) = 0.9$, $p = .362$, Cohen's $d = .01$. These findings have a similar interpretation, that is, that there may be small fluctuations, but the mean differences between time points are very small in magnitude.

With regard to pet ownership, between waves, 671 participants had no pet, 272 went from no pet to having a pet, 132 went from having a pet to no pet, and 2,840 had a pet at both points. McNemar's test was conducted to statistically test change in pet ownership, which was significant, $\chi^2(1) = 48$, $p < .001$, indicating a 3.6% increase in pet ownership from Time 1 to Time 2.

Sensitivity Testing

To evaluate the robustness of findings, alternative analytic techniques were tested, such as treating the prosocial behavior outcomes as continuous sum-scores and conducting linear regression, modeling the outcome variables as individual ordinal items using ordinal logistic regression, and changing the categorization of pet ownership groupings (i.e., dichotomized into pet owners and non-pet owners, and non-mutually exclusive groupings with dogs being the primary group). Through these examinations, the findings were largely consistent with slight variations in estimates. However, we believe the results reported in this article to be robust in reflecting the relationship between pet ownership and engagement in prosocial behaviors.

Discussion

This study followed up on [REDACTED FOR REVIEW] by examining parent- and adolescent-reported adolescent prosocial behaviors in greater detail. In contrast with [REDACTED FOR REVIEW], this study found some species-level differences in adolescent-reported engagement in prosocial behaviors (Aim 1), in contrast with the hypothesis that there would be no differences in parent- and adolescent-reported adolescent engagement in prosocial behavior, indicating support for examining reported prosocial behaviors in a more nuanced manner. Related to Aim 2, this study found relative stability in reported engagement in prosocial behavior across groups of participants.

This study examined differences in reported prosocial behavior among families that own no pets, only dogs, only cats, other types of pets, or multiple types of pets (e.g., dogs and cats). Compared to adolescents in non-pet owning families, adolescents in dog-owning and mixed-pet families had greater odds of reporting agreement with prosocial behaviors aligning with their own behaviors, controlling for gender and age. There was a significant interaction between gender and being in a mixed-pet household within the adolescent-report items, with girls in these households reporting greater odds of prosocial behavior compared to boys with no pets, controlling for age. When evaluating parent-report, pet-ownership was not associated with greater prosocial behavior agreement. Multi-informant discrepancy is a well-documented phenomenon, potentially driven in part by the environmental context of the individual (for a review, see De Los Reyes et al., 2015). The exact cause of discrepancy between parent- and adolescent-report measures in this study is unknown, but, given that the factors are not very highly correlated, it is possible that slightly different constructs are being captured. It is also possible that adolescents more readily report their own prosocial behavior, as the adolescent sum-scores are slightly higher than the parent sum-scores. Similarly, discrepancies in ratings may

be based on the amount of time on which adolescents can evaluate their behavior, where parents may have less time to observe these behaviors (e.g., time at school). This discrepancy could be a reflection of differing appraisals of prosociality, which carries clinically relevant implications, wherein low (and discrepant) parental appraisals of prosocial behavior could be indicative of potential for the development of emotional problems (Taylor & Wood, 2012).

Across parent and adolescent reports and consistent with past literature (e.g., Carlo et al., 2007; Van Der Graaff et al., 2018), girls reported greater engagement with prosocial behaviors, compared to boys, when controlling for pet type and age. Thus, boys may be a potential target of future research and intervention given the benefits associated with increased prosocial behavior (e.g., Hirani et al., 2022). It is possible that current measures of prosocial behavior may differentially capture the construct for boys and girls, an idea that was recently explored by Graybill et al. (2021), finding some evidence of measurement non-invariance using the original SDQ structure. Future research should continue to explore why the development of prosocial behavior appears to be discrepant for boys and girls, whether it be due to measurement issues, socio-developmental factors, or other causes. Inconsistent with some past HAI literature (e.g., Wenden et al., 2021), this study did not find an impact of age on reported engagement in prosocial behavior, controlling for pet type and gender. It is possible that this inconsistency could be due either to cultural differences (i.e., Australia vs. United States), or because Wenden et al.'s (2021) sample was quite a bit younger, with an average age of 3.3 years. Therefore, it is possible that in the developmental period captured by this study, reporting of the specific items examined have stabilized. Given the involvement of social contexts in prosocial behaviors (Crone & Achterberg, 2022), other prosocial behavior items could produce differential findings with respect to age.

Given the findings of this study, there is some evidence that adolescents in dog-owning and mixed-pet households report higher levels of prosociality compared to adolescents in non-pet owning households. Overall, these findings are supportive of the idea that pet ownership alone, particularly for families with dogs, could potentially facilitate adolescent prosocial development. This is in contrast with findings from Reider et al. (2023), [REDACTED FOR REVIEW], and Jacobson and Chang (2018), which broadly found pet ownership not to be a significant predictor of engagement in prosocial behavior. There were some inconsistencies with other studies that also found positive relationships between pet ownership and prosocial behaviors, such as age in this study not having a significant impact on prosocial behavior (in contrast with findings from Wenden et al., 2021) as well as the presence of pet species-level differences in this study (in contrast with findings from Christian et al., 2020). Generally, this study adds support to the idea that dog ownership (or mixed pet ownership) could potentially positively impact positive adolescent development. Future research should investigate the specific relationships (e.g., emotional bond) between adolescents and pets, as well as evaluate a greater breadth of prosocial behaviors across time, to determine if pet ownership may foster any specific positive adolescent development skills, through caretaking or other interactions. These findings should be taken with appropriate caution because potential causal relationships were not able to be explored in this research, and because there are multiple plausible causal pathways (e.g., owning a pet dog increases prosocial behavior vs. prosocially oriented adolescents may be more likely to want to care for a dog).

There was relative stability between Time 1 and Time 2 in terms of broad within-group reporting of prosocial behavior items. These analyses indicate that there were no significant, directional changes in reported prosocial behavior as the ABCD Study® cohort ages, which is

notable given that the current age of the cohort is one in which social behaviors often change significantly (House et al., 2013). It is possible that the limited nature of the prosocial measure administered does not fully capture the types of changes generally seen during this period of theoretical change, or that there are other systematic differences in the sample for which future research could potentially account (e.g., family socio-economic status). Furthermore, adolescents and their parents overwhelmingly selected the *Certainly True* level of each prosocial item. This pattern of responding indicates a deficit in coverage of the underlying trait that the items are meant to reflect, which could be due to social desirability bias.

Limitations

While the ABCD Study® has significant strengths, it has several key weaknesses. One limitation is the limited depth of the measures available as secondary data. Specifically, prosocial behavior is limited to three items for parents and adolescents, and pet ownership does not include details about the role the pet holds in the household (e.g., guard dog, service dog) or the emotional bond between adolescents and their pets. This type of limitation is inherent in a dataset as large as the ABCD Study®, as researchers aim to ameliorate participant burden by reducing the number of items administered. While this dataset allows researchers significant statistical power, that comes at the expense of nuance and depth of the constructs being investigated. It should also be noted that according to recommendations by Ferguson (2009), the effect sizes garnered through these analyses may not be practically significant, indicating that the statistical significance reached may be an artifact of the large sample size being used. Additionally, because the measures in this study used only select items from the SDQ, the items may lack sufficient coverage related to prosocial behaviors, which are complex and change depending on the social context (e.g., Padilla-Walker et al., 2015, 2018; Padilla-Walker et al., 2018). Other limitations

include the use of self- and parent-report measures that may be influenced by social desirability bias (e.g., Muris et al., 2003), which is a probable cause of the ceiling effects observed among participants. As the ABCD Study® continues to collect data, future research should explore longitudinal data to attempt to elucidate any potentially causal pathways between pet ownership and prosocial behavior.

Conclusion

In a large, national dataset of adolescents in the United States, this study elucidated some differences in reported prosocial behavior engagement between families who own only dogs, only cats, only other pets, or a mix of different types of pets, compared to families who do not own pets. Specifically, parent-reported adolescent prosocial behavior was not associated with pet ownership, but adolescent-reported behavior was, with adolescents in dog-owning and mixed-pet households reporting greater odds of prosocial behavior, holding gender and age constant. Within adolescent reports, there was also a significant interaction between gender and pet ownership, specifically girls in mixed-pet households reporting greater odds of prosocial behavior compared to boys with no pets. Furthermore, over a one-year time period, reported engagement in prosocial behavior remained relatively stable and there was a 3.6% increase in pet ownership.

References

Agresti, A. (2013). *Categorical data analysis* (3rd ed). Wiley.

Applebaum, J. W., Peek, C. W., & Zsembik, B. A. (2023). Examining U.S. pet ownership using the General Social Survey. *The Social Science Journal*, *60*(1), 110–119. https://doi.org/10.1080/03623319.2020.1728507

Auchter, A. M., Hernandez Mejia, M., Heyser, C. J., Shilling, P. D., Jernigan, T. L., Brown, S. A., Tapert, S. F., & Dowling, G. J. (2018). A description of the ABCD organizational structure and communication framework. *Developmental Cognitive Neuroscience*, *32*, 8–15. https://doi.org/10.1016/j.dcn.2018.04.003

Bates, E. J. S., Berny, L. M., Ganiban, J. M., Natsuaki, M. N., Neiderhiser, J. M., Shaw, D. S., & Leve, L. D. (2023). Examination of promotive and protective effects on early adolescent prosocial behavior through a bioecological lens. *Frontiers in Psychology*, *14*, 1280346. https://doi.org/10.3389/fpsyg.2023.1280346

Brant, R. (1990). Assessing proportionality in the proportional odds model for ordinal logistic regression. *Biometrics*, *46*(4), 1171–1178. https://www.jstor.org/stable/2532457

Brittian, A. S., & Humphries, M. L. (2015). Prosocial behavior during adolescence. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 221–227). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.23190-5

Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In R. M. Lerner & W. Damon (Eds.), *Handbook of child psychology* (6th ed., Vol. 1, pp. 793–828). John Wiley & Sons.

Caputi, M., Lecce, S., Pagnin, A., & Banerjee, R. (2012). Longitudinal effects of theory of mind on later peer relations: The role of prosocial behavior. *Developmental Psychology*, *48*(1), 257–270. https://doi.org/10.1037/a0025402

Carlo, G., Crockett, L. J., Randall, B. A., & Roesch, S. C. (2007). A latent growth curve analysis of prosocial behavior among rural adolescents. *Journal of Research on Adolescence*, *17*(2), 301–324. https://doi.org/10.1111/j.1532-7795.2007.00524.x

Chen, L., Chen, X., Zhao, S., French, D. C., Jin, S., & Li, L. (2019). Predicting substance use and deviant behavior from prosociality and sociability in adolescents. *Journal of Youth and Adolescence*, *48*(4), 744–752. https://doi.org/10.1007/s10964-018-0940-4

Chen, N. R. Y., Majeed, N. M., Lai, G. J., Koh, P. S., Kasturiratna, K. T. A. S., Kaur, M., Ho, A. Z. Y., Yong, J. C., & Hartanto, A. (2024). Human–animal interaction and human prosociality: A meta-analytic review of experimental and correlational studies. *Anthrozoös*, *37*(2), 269–288. https://doi.org/10.1080/08927936.2023.2288745

Christian, H., Mitrou, F., Cunneen, R., & Zubrick, S. R. (2020). Pets are associated with fewer peer problems and emotional symptoms, and better prosocial behavior: Findings from the longitudinal study of Australian children. *The Journal of Pediatrics*, *220*, 200-206.e2. https://doi.org/10.1016/j.jpeds.2020.01.012

Clark, D. B., Fisher, C. B., Bookheimer, S., Brown, S. A., Evans, J. H., Hopfer, C., Hudziak, J., Montoya, I., Murray, M., Pfefferbaum, A., & Yurgelun-Todd, D. (2018). Biomedical ethics and clinical oversight in multisite observational neuroimaging studies with children and adolescents: The ABCD experience. *Developmental Cognitive Neuroscience*, *32*, 143–154. https://doi.org/10.1016/j.dcn.2017.06.005

Collie, R. J., Martin, A. J., Roberts, C. L., & Nassar, N. (2018). The roles of anxious and prosocial behavior in early academic performance: A population-based study examining unique and moderated effects. *Learning and Individual Differences*, *62*, 141–152. https://doi.org/10.1016/j.lindif.2018.02.004

Crone, E. A., & Achterberg, M. (2022). Prosocial development in adolescence. *Current Opinion in Psychology*, *44*, 220–225. https://doi.org/10.1016/j.copsyc.2021.09.020

Cruz, A. M., Carlo, G., Gulseven, Z., & Vandell, D. L. (2025). A longitudinal study of prosocial behaviors predicting later academic performance in US Latine early adolescents. *Journal of Adolescence*, *97*(1), 113–123. https://doi.org/10.1002/jad.12401

De Los Reyes, A., Augenstein, T. M., Wang, M., Thomas, S. A., Drabick, D. A. G., Burgers, D. E., & Rabinowitz, J. (2015). The validity of the multi-informant approach to assessing child and adolescent mental health. *Psychological Bulletin*, *141*(4), 858–900. https://doi.org/10.1037/a0038498

Duncan, T. E., & Duncan, S. E. (2009) The ABC's of LGM: An introductory guide to latent variable growth curve modeling. *Social and Personality Psychology Compass*, (*3*)6, 979–991. https://doi.org/10.1111/j.1751-9004.2009.00224.x

Eisenberg, N., & Mussen, P. H. (1989). *The roots of prosocial behavior in children*. Cambridge University Press. https://doi.org/10.1017/CBO9780511571121

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

Ferguson, C. J. (2009). An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice*, *40*(5), 532–538. https://doi.org/10.1037/a0015808

Garavan, H., Bartsch, H., Conway, K., Decastro, A., Goldstein, R. Z., Heeringa, S., Jernigan, T., Potter, A., Thompson, W., & Zahs, D. (2018). Recruiting the ABCD sample: Design considerations and procedures. *Developmental Cognitive Neuroscience*, *32*, 16–22. https://doi.org/10.1016/j.dcn.2018.04.004

Goodman, R., Meltzer, H., & Bailey, V. (1998). The strengths and difficulties questionnaire: A pilot study on the validity of the self-report version. *European Child & Adolescent Psychiatry*, *7*(3), 125–130. https://doi.org/10.1007/s007870050057

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry*, *38*(5), 581–586. https://doi.org/10.1111/j.1469-7610.1997.tb01545.x

Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, *60*(1), 549–576. https://doi.org/10.1146/annurev.psych.58.110405.085530

Gray, P. B., & Young, S. M. (2011). Human–pet dynamics in cross-cultural perspective. *Anthrozoös*, *24*(1), 17–30. https://doi.org/10.2752/175303711X12923300467285

Graybill, E., Roach, A., & Barger, B. (2021). Factor structure of the self-report strength and difficulties questionnaire in a diverse U.S. sample. *Journal of Psychopathology and Behavioral Assessment*, *43*(2), 388–398. https://doi.org/10.1007/s10862-020-09833-4

Güroğlu, B., Van Den Bos, W., & Crone, E. A. (2014). Sharing and giving across adolescence: An experimental study examining the development of prosocial behavior. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00291

Gustafsson, E., Alawi, N., & Andersen, P. N. (2020). Companion animals and religion: A survey of attitudes among Omani students. *Society & Animals*, *29*(2), 132–152. https://doi.org/10.1163/15685306-bja10005

[REDACTED FOR PEER REVIEW]

Hirani, S., Ojukwu, E., & Bandara, N. A. (2022). Understanding the role of prosocial behavior in youth mental health: Findings from a scoping review. *Adolescents*, *2*(3), 358–380. https://doi.org/10.3390/adolescents2030028

House, B. R., Silk, J. B., Henrich, J., Barrett, H. C., Scelza, B. A., Boyette, A. H., Hewlett, B. S., McElreath, R., & Laurence, S. (2013). Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences*, *110*(36), 14586–14591. https://doi.org/10.1073/pnas.1221217110

Jacobson, K. C., & Chang, L. (2018). Associations between pet ownership and attitudes toward pets with youth socioemotional outcomes. *Frontiers in Psychology*, *9*, 2304. https://doi.org/10.3389/fpsyg.2018.02304

Kilmer, M., Hong, M., Randolph, D., Reichel, A., Huetter, S., Bowden, M., & Kilmer, C. (2024). Animal-assisted therapy in pediatric autism spectrum disorder: A case report. *Nurse Practitioner*, *49*(3), 31–39. https://doi.org/10.1097/01.NPR.0000000000000151

Kuder, G. F., & Richardson, M. W. (1937). The theory of the estimation of test reliability. *Psychometrika*, *2*(3), 151–160. https://doi.org/10.1007/BF02288391

Lam, C. M. (2012). Prosocial involvement as a positive youth development construct: A conceptual review. *The Scientific World Journal*, *2012*, 1–8. https://doi.org/10.1100/2012/769158

Liang, M., Mo, H., & Duan, J. (2025). The factors influencing children's helping behavior: The roles of cognition and empathy concern. *Behavioral Sciences*, *15*(5), 689. https://doi.org/10.3390/bs15050689

McCullough, A., Ruehrdanz, A., Garthe, R., Hellman, C., & O'Haire, M. (2021). Measuring the social, behavioral, and academic effects of classroom pets on third and fourth-grade students. *Human Animal Interaction Bulletin*, *9*(1), 1–21. https://doi.org/10.1079/hai.2021.0023

Meulenbeek, K., Loheide-Niesmann, L., Spagnuolo, F., & Cima, M. J. (2026). Positive youth development and prosocial behavior: A systematic review and multilevel meta-analysis. *Journal of Adolescence*, *98*(1), 7–35. https://doi.org/10.1002/jad.70040

Mueller, M. K. (2014). Is Human-animal interaction (HAI) linked to positive youth development? Initial answers. *Applied Developmental Science*, *18*(1), 5–16. https://doi.org/10.1080/10888691.2014.864205

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus User's Guide* (8th ed.). Muthén & Muthén.

Padilla-Walker, L. M., Carlo, G., & Memmott-Elison, M. K. (2018). Longitudinal change in adolescents' prosocial behavior toward strangers, friends, and family. *Journal of Research on Adolescence*, *28*(3), 698–710. https://doi.org/10.1111/jora.12362

Padilla-Walker, L. M., Dyer, W. J., Yorgason, J. B., Fraser, A. M., & Coyne, S. M. (2015). Adolescents' prosocial behavior toward family, friends, and strangers: A person-centered approach. *Journal of Research on Adolescence*, *25*(1), 135–150. https://doi.org/10.1111/jora.12102

Padilla-Walker, L. M., Memmott-Elison, M. K., & Nielson, M. G. (2018). Longitudinal change in high-cost prosocial behaviors of defending and including during the transition to

adulthood. *Journal of Youth and Adolescence*, *47*(9), 1853–1865. https://doi.org/10.1007/s10964-018-0875-9

Penner, L. A., Dovidio, J. F., Piliavin, J. A., & Schroeder., D. A. (2005). Prosocial behavior: Multilevel perspectives. *Annual Review of Psychology*, *56*(1), 365–392. https://doi.org/10.1146/annurev.psych.56.091103.070141

Pfattheicher, S., Nielsen, Y. A., & Thielmann, I. (2022). Prosocial behavior and altruism: A review of concepts and definitions. *Current Opinion in Psychology*, *44*, 124–129. https://doi.org/10.1016/j.copsyc.2021.08.021

R Core Team. (2023). *R: A language and environment for statistical computing* [Computer software]. R Foundation for Statistical Computing.

Reider, L. B., Kim, E., Mahaffey, E., & LoBue, V. (2023). The impact of household pets on children's daily lives: Differences in parent–child conversations and implications for children's emotional development. *Developmental Psychology*, *59*(11), 2148–2161. https://doi.org/10.1037/dev0001595

Rodriguez, K. E., Herzog, H., & Gee, N. R. (2021). Variability in human-animal interaction research. *Frontiers in Veterinary Science*, *7*, 619600. https://doi.org/10.3389/fvets.2020.619600

Saragosa-Harris, N. M., Chaku, N., MacSweeney, N., Guazzelli Williamson, V., Scheuplein, M., Feola, B., Cardenas-Iniguez, C., Demir-Lira, E., McNeilly, E. A., Huffman, L. G., Whitmore, L., Michalska, K. J., Damme, K. S., Rakesh, D., & Mills, K. L. (2022). A practical guide for researchers and reviewers using the ABCD Study and other large longitudinal datasets. *Developmental Cognitive Neuroscience*, *55*, 101115. https://doi.org/10.1016/j.dcn.2022.101115

Taylor, P. J., & Wood, A. M. (2013). Discrepancies in parental and self-appraisals of prosocial characteristics predict emotional problems in adolescents. *British Journal of Clinical Psychology*, *52*(3), 269–284. https://doi.org/10.1111/bjc.12013

Van der Graaff, J., Carlo, G., Crocetti, E., Koot, H. M., & Branje, S. (2018). Prosocial behavior in adolescence: Gender differences in development and links with empathy. *Journal of Youth and Adolescence*, *47*(5), 1086–1099. https://doi.org/10.1007/s10964-017-0786-1

van der Storm, L., van Lissa, C. J., Lucassen, N., Helmerhorst, K. O. W., & Keizer, R. (2022). Maternal and paternal parenting and child prosocial behavior: A meta-analysis using a structural equation modeling design. *Marriage & Family Review*, *58*(1), 1–37. https://doi.org/10.1080/01494929.2021.1927931

Vidović, V. V., Štetić, V. V., & Bratko, D. (1999). Pet ownership, type of pet and socio-emotional development of school children. *Anthrozoös*, *12*(4), 211–217. https://doi.org/10.2752/089279399787000129

Wenden, E. J., Lester, L., Zubrick, S. R., Ng, M., & Christian, H. E. (2021). The relationship between dog ownership, dog play, family dog walking, and pre-schooler social–emotional development: Findings from the PLAYCE observational study. *Pediatric Research*, *89*(4), 1013–1019. https://doi.org/10.1038/s41390-020-1007-2

Yao, Z., & Enright, R. (2023). Social class and prosocial behavior in early adolescence: The moderating roles of family and school factors. *Journal of Moral Education*, *52*(3), 310–324. https://doi.org/10.1080/03057240.2022.2031920

Yoo, H., Feng, X., & Day, R. D. (2013). Adolescents' empathy and prosocial behavior in the family context: A longitudinal study. *Journal of Youth and Adolescence*, *42*(12), 1858–1872. https://doi.org/10.1007/s10964-012-9900-6

Table 1

Missing Data by Variable

Variable	*n*	(%)
Parent		
Prosocial 1	232	2.7
Prosocial 2	232	2.7
Prosocial 3	232	2.7
Adolescent		
Prosocial 1	1	0.01
Prosocial 2	1	0.01
Prosocial 3	1	0.01
Pet	0	0.00
Gender	146	1.7
Age	183	2.2

Note. Missing percentages have been calculated based on the total sample after excluding siblings enrolled in the study (n = 8,504)

Table 2

Response Rates to the Adolescent and Parent Prosocial Behavior Items

Responses	Not True (%)	Somewhat True (%)	Certainly True (%)
Parent			
Prosocial 1	164 (2.0)	2,157 (26.1)	5,951 (71.9)
Prosocial 2	140 (1.7)	1,644 (19.9)	6,488 (78.4)
Prosocial 3	359 (4.3)	2,570 (31.1)	5,343 (64.6)
Adolescent			
Prosocial 1	42 (0.5)	1,610 (18.9)	6,851 (80.6)
Prosocial 2	110 (1.3)	2,432 (28.6)	5,961 (70.1)
Prosocial 3	148 (1.7)	3,178 (37.4)	5,177 (60.9)

Table 3

Proportional Odds Results

Model	Item	χ^2	*df*	*p*
No Covariates	Parent			
	Prosocial 1	6.2	4	.19
	Prosocial 2	3.3	4	.51
	Prosocial 3	6.1	4	.19
	Adolescent			
	Prosocial 1	0.8	4	.94
	Prosocial 2	3.5	4	.47
	Prosocial 3	4.5	4	.35
Covariates Included	Parent			
	Prosocial 1	5.8	6	.44
	Prosocial 2	4.5	6	.60
	Prosocial 3	6	6	.42
	Adolescent			
	Prosocial 1	3.0	6	.81
	Prosocial 2	4.9	6	.56
	Prosocial 3	3.2	6	.78

Table 4

Pet Ownership Group Prosocial Sum-Scores

Reporter	Item	*M*	*SD*
Parent	No Pet	4.95	1.51
	Dog	4.97	1.51
	Cat	4.82	1.63
	Other	4.87	1.58
	Mixed	4.93	1.54
Adolescent	No Pet	5.01	1.12
	Dog	5.10	1.06
	Cat	5.03	1.13
	Other	5.08	1.06
	Mixed	5.12	1.06

Table 5

Pet Ownership and Adolescent Prosocial Ordinal Logistic Regressions

Model	Variable	β	*SE*	95% Wald CI Lower	% Wald CI Upper	*OR*/*AOR*	*p*
Non-Predictor Model	Item 1 Threshold 1	–6.87	0.20	–7.27	–6.48	<0.01	<.001
	Item 1 Threshold 2	–2.15	0.06	–2.27	–2.02	0.12	<.001
	Item 2 Threshold 1	–6.22	0.19	–6.60	–5.85	<0.01	<.001
	Item 2 Threshold 2	–1.42	0.06	–1.53	–1.31	0.24	<.001
	Item 3 Threshold 1	–5.72	0.16	–6.04	–5.41	0.00	<.001
	Item 3 Threshold 2	–0.72	0.04	–0.80	–0.64	0.49	<.001
	Item 1 Factor Loading	1.80	0.08	1.64	1.96	-	<.001
	Item 2 Factor Loading	2.06	0.10	1.87	2.26	-	<.001
	Item 3 Factor Loading	1.97	0.09	1.79	2.16	-	<.001
Non-Covariate	Item 1 Threshold 1	–6.75	0.20	–7.15	–6.36	<0.01	<.001
	Item 1 Threshold 2	–2.02	0.07	–2.16	–1.87	0.13	<.001
	Item 2 Threshold 1	–6.07	0.19	–6.45	–5.69	<0.01	<.001
	Item 2 Threshold 2	–1.26	0.07	–1.41	–1.12	0.28	<.001
	Item 3 Threshold 1	–5.56	0.17	–5.89	–5.23	<0.01	<.001
	Item 3 Threshold 2	–0.57	0.07	–0.69	–0.44	0.57	<.001
	Pet Group[a]						
	Dog	0.10	0.04	0.03	0.18	1.11	.010
	Cat	0.02	0.06	–0.08	0.13	1.02	.661
	Other	0.08	0.06	–0.05	0.20	1.08	.223
	Mixed	0.13	0.04	0.05	0.21	1.14	.001
	Item 1 Factor Loading	1.81	0.08	1.65	1.96	-	<.001
	Item 2 Factor Loading	2.06	0.10	1.87	2.26	-	<.001
	Item 3 Factor Loading	1.96	0.09	1.78	2.14	-	<.001
Covariate	Item 1 Threshold 1	–6.51	0.20	–6.91	–6.11	<0.01	<.001
	Item 1 Threshold 2	–1.73	0.07	–1.87	–1.60	0.18	<.001
	Item 2 Threshold 1	–5.71	0.18	–6.07	–5.36	<0.01	<.001
	Item 2 Threshold 2	–0.91	0.07	–1.05	–0.77	0.40	<.001
	Item 3 Threshold 1	–5.21	0.16	–5.52	–4.91	0.01	<.001

	Item 3 Threshold 2	–0.23	0.07	–0.36	–0.10	0.80	<.001
	Pet Group[a]						
	Dog	0.11	0.04	0.03	0.19	1.11	.010
	Cat	0.03	0.06	–0.09	0.14	1.03	.656
	Other	0.05	0.06	–0.07	0.17	1.05	.444
	Mixed	0.12	0.04	0.04	0.20	1.12	.004
	Gender[b]	0.42	0.03	0.36	0.48	1.52	<.001
	Age[c]	0.02	0.02	–0.03	0.06	1.02	.411
	Item 1 Factor Loading	1.78	0.08	1.63	1.94	-	<.001
	Item 2 Factor Loading	2.02	0.10	1.83	2.21	-	<.001
	Item 3 Factor Loading	1.92	0.09	1.75	2.10	-	<.001
Covariate Interaction	Item 1 Threshold 1	–6.59	0.21	–7.00	–6.18	<0.01	<.001
	Item 1 Threshold 2	–1.81	0.08	–1.97	–1.65	0.16	<.001
	Item 2 Threshold 1	–5.79	0.19	–6.15	–5.42	<0.01	<.001
	Item 2 Threshold 2	–1.00	0.08	–1.16	–0.83	0.37	<.001
	Item 3 Threshold 1	–5.29	0.16	–5.61	–4.97	0.01	<.001
	Item 3 Threshold 2	–0.31	0.08	–0.46	–0.16	0.74	<.001
	Pet Group[a]						
	Dog	0.04	0.05	–0.06	0.14	1.04	.435
	Cat	0.03	0.07	–0.11	0.17	1.03	.688
	Other	0.06	0.08	–0.10	0.22	1.07	.444
	Mixed	0.03	0.05	–0.07	0.14	1.03	.518
	Gender[b]	0.31	0.06	0.19	0.44	1.37	<.001
	Age[c]	0.02	0.02	–0.03	0.06	1.02	.418
	Dog*Girl	0.16	0.08	0.00	0.33	1.18	.050
	Cat*Girl	–0.01	0.11	–0.23	0.22	1.00	.966
	Other*Girl	–0.02	0.13	–0.27	0.23	0.98	.891
	Mixed*Girl	0.20	0.08	0.04	0.36	1.22	.016
	Item 1 Factor Loading	1.79	0.08	1.63	1.94	-	<.001
	Item 2 Factor Loading	2.01	0.10	1.83	2.20	-	<.001
	Item 3 Factor Loading	1.92	0.09	1.74	2.09	-	<.001

Note. CI = Confidence interval; *AOR* = Adjusted *OR*.
[a]The reference category is: No Pet.

[b]The reference category is: Boy.
[c]Age has been mean centered.

Table 6

Pet Ownership and Parent Prosocial Ordinal Logistic Regressions

Model	Variable	β	*SE*	95% Wald CI Lower	95% Wald CI Upper	*OR*/*AOR*	*p*
Non-Predictor Model	Item 1 Threshold 1	–7.40	0.22	–7.84	–6.97	<0.01	<.001
	Item 1 Threshold 2	–2.07	0.08	–2.22	–1.91	0.13	<.001
	Item 2 Threshold 1	–12.28	0.83	–13.90	–10.66	<0.01	<.001
	Item 2 Threshold 2	–4.53	0.30	–5.12	–3.94	0.01	<.001
	Item 3 Threshold 1	–6.05	0.17	–6.38	–5.73	<0.01	<.001
	Item 3 Threshold 2	–1.32	0.06	–1.44	–1.20	0.27	<.001
	Item 1 Factor Loading	3.09	0.11	2.87	3.31	-	<.001
	Item 2 Factor Loading	5.48	0.40	4.69	6.26	-	<.001
	Item 3 Factor Loading	3.04	0.10	2.84	3.24	-	<.001
Non-Covariate	Item 1 Threshold 1	–7.38	0.24	–7.84	–6.92	<0.01	<.001
	Item 1 Threshold 2	–2.04	0.11	–2.25	–1.83	0.13	<.001
	Item 2 Threshold 1	–12.25	0.82	–13.85	–10.64	<0.01	<.001
	Item 2 Threshold 2	–4.49	0.30	–5.08	–3.90	0.01	<.001
	Item 3 Threshold 1	–6.03	0.19	–6.39	–5.66	<0.01	<.001
	Item 3 Threshold 2	–1.29	0.10	–1.48	–1.10	0.27	<.001
	Pet Group[a]						
	Dog	0.04	0.04	–0.04	0.11	1.04	.316
	Cat	–0.07	0.05	–0.17	0.03	0.93	.145
	Other	–0.04	0.06	–0.16	0.07	0.96	.467
	Mixed	0.02	0.04	–0.05	0.09	1.02	.522
	Item 1 Factor Loading	3.09	0.11	2.87	3.31	-	<.001
	Item 2 Factor Loading	5.48	0.41	4.67	6.28	-	<.001
	Item 3 Factor Loading	3.04	0.10	2.84	3.24	-	<.001
Covariate	Item 1 Threshold 1	–7.03	0.23	–7.47	–6.59	<0.01	<.001
	Item 1 Threshold 2	–1.67	0.11	–1.88	–1.47	0.19	<.001
	Item 2 Threshold 1	–11.51	0.75	–12.98	–10.05	<0.01	<.001
	Item 2 Threshold 2	–3.81	0.26	–4.33	–3.30	0.02	<.001
	Item 3 Threshold 1	–5.68	0.18	–6.03	–5.32	<0.01	<.001

Item 3 Threshold 2	–0.94	0.10	–1.13	–0.75	0.39	<.001
Pet Group[a]			0.00			
Dog	0.04	0.04	–0.03	0.11	1.04	.292
Cat	–0.08	0.05	–0.19	0.02	0.92	.107
Other	–0.06	0.06	–0.18	0.05	0.94	.284
Mixed	<0.01	0.04	–0.07	0.08	1.00	.916
Gender[b]	0.30	0.03	0.24	0.35	1.35	<.001
Age[c]	–0.03	0.02	–0.07	0.01	0.97	.115
Item 1 Factor Loading	3.06	0.11	2.84	3.28	-	<.001
Item 2 Factor Loading	5.39	0.39	4.63	6.15	-	<.001
Item 3 Factor Loading	3.03	0.10	2.83	3.23	-	<.001

Note. CI = Confidence interval; *AOR* = Adjusted *OR*.
[a]The reference category is: No Pet.
[b]The reference category is: Boy.
[c]Age has been mean centered.

Table 7

Results of Model Fitting to Prosocial Measure Outcomes

Item	Model	AIC	BIC	Log-likelihood
Adolescent Prosocial	Non-Predictor	30014	30078	–14998
	Non-Covariate	30009	30101	–14992
	Covariate	29185	29290	–14577
	Covariate Interaction	29183	29317	–14573
Parent Prosocial	Non-Predictor	27520	27583	–13751
	Non-Covariate	27521	27613	–13748
	Covariate	26876	26981	–13423

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion.

Table 8

Contingency Tables for Each Prosocial Behavior Item at the Three- and Four-Year Follow-Ups

Parent Prosocial 1	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	16	43	10	69
Somewhat True	30	587	381	998
Certainly True	14	404	2333	2751
Total	60	1034	2724	3818
Parent Prosocial 2	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	15	36	19	70
Somewhat True	28	385	391	804
Certainly True	20	328	2596	2944
Total	63	749	3006	3818
Parent Prosocial 3	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	64	91	30	185
Somewhat True	76	696	495	1267
Certainly True	20	416	1930	2366
Total	160	1203	2455	3818
Adolescent Prosocial 1	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	5	20	7	32
Somewhat True	3	343	484	830
Certainly True	3	322	2730	3055
Total	11	685	3221	3917
Adolescent Prosocial 2	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	2	30	13	45
Somewhat True	19	592	594	1205
Certainly True	12	448	2207	2667
Total	33	1070	2814	3917
Adolescent Prosocial 3	Three-Year			
Four-Year	Not True	Somewhat True	Certainly True	Total
Not True	16	50	17	83
Somewhat True	38	814	694	1546
Certainly True	13	567	1708	2288
Total	67	1431	2419	3917

Table 9

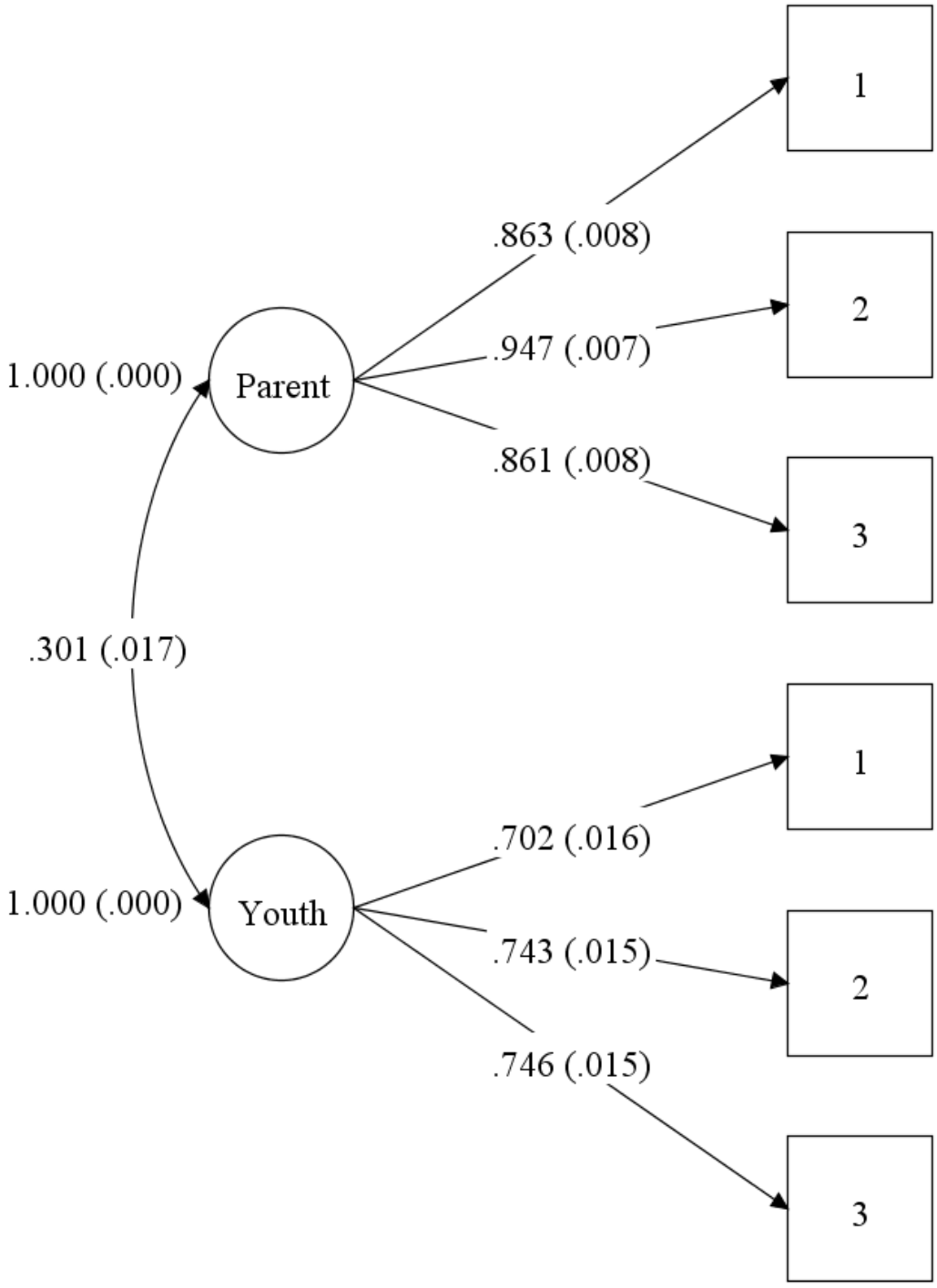
Results of Symmetry, Quasi-Symmetry, and Marginal Homogeneity Analyses

Item	Model	*df*	AIC	BIC	Deviance G^2 (*p*)
Parent Prosocial 1	Symmetry	3	73.2	74.4	3.7 (.296)
	Marginal homogeneity	2	-	-	1.9 (.387)
	Quasi-symmetry	1	75.3	76.9	1.8 (.180)
Parent Prosocial 2	Symmetry	3	76.3	77.5	6.6 (.086)
	Marginal homogeneity	2	-	-	5.3 (.071)
	Quasi-symmetry	1	75.1	76.6	1.3 (.254)
Parent Prosocial 3	Symmetry	3	84.5	85.7	10.2 (.017)
	Marginal homogeneity	2	-	-	10.2 (.006)
	Quasi-symmetry	1	78.3	79.9	0.0 (1.00)
Adolescent Prosocial 1	Symmetry	3	111.7	112.9	48.5 (<.001)
	Marginal homogeneity	2	-	-	46.1 (<.001)
	Quasi-symmetry	1	69.5	71.1	2.4 (.121)
Adolescent Prosocial 2	Symmetry	3	90.4	91.6	23.1 (<.001)
	Marginal homogeneity	2	-	-	21.4 (<.001)
	Quasi-symmetry	1	73.1	74.6	1.7 (.192)
Adolescent Prosocial 3	Symmetry	3	86.3	87.5	15.0 (.002)
	Marginal homogeneity	2	-	-	14.8 (.001)
	Quasi-symmetry	1	75.6	77.1	0.2 (.655)

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion.

Figure 1

Model Diagram Showing Correlation Between Adolescent and Parent Factors



Note. Figure was generated in MPlus version 8.11 and shows STDYX estimates (estimated via MLR with logit link).