

Attachment security predicts adolescents' prosocial and health protective responses to the COVID-19 pandemic

Brianne R. Coulombe  | Tuppett M. Yates 

Department of Psychology, University of California, Riverside, California, USA

Correspondence

Brianne R. Coulombe, Department of Psychology, University of California, Riverside, CA 92521, USA.
Email: brianne.coulombe@email.ucr.edu

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Abstract

Prosocial and health protective behaviors are critical to contain the COVID-19 pandemic, yet adolescents have been difficult to engage. Attachment security promotes adolescents' capacities to navigate stress, and influences prosocial and health behaviors. Drawing on a diverse sample of 202 adolescents (48% female; 47.5% Latinx) this study evaluated relations among attachment, mental health, and prosocial and health protective responses to the COVID-19 pandemic. Attachment security (age 12) predicted adolescents' (age 15) COVID-19 prosocial ($f^2 = .201$) and health protective behaviors ($f^2 = .274$) during the pandemic via smaller-than-expected increases in mental health symptoms above pre-pandemic levels (age 14). Findings highlight the importance of attachment for supporting adolescents' mental health responses to life stressors and promoting prosocial and health protective behaviors.

Prosocial behavior, or behavior intended to benefit others (Batson & Powell, 2003), is of paramount importance to containing the COVID-19 pandemic. Indeed, many of the health protective guidelines set forth by the Centers for Disease Control (CDC) incur benefits not only for the actor, but also for others. For example, masking prevents the contraction of COVID-19, but it prevents transmission of the disease to others even more strongly (Howard et al., 2021). This investigation sought to elucidate relational and mental health influences on adolescents' COVID-19 prosocial and health protective behaviors (e.g., social distancing, wearing masks, avoiding gatherings). These findings will inform public health efforts to contain the current pandemic, and engage adolescents' prosocial and health protective actions in the face of future public health crises.

Peer-reviewed studies of prosocial and health behaviors during the COVID-19 pandemic to date have generally used cross-sectional and experimental designs with adult samples to identify factors that elicit prosocial and

health protective actions. For example, Abel and Brown (2020) found that adults primed with images of prosocial behavior (e.g., political leaders advocating for community needs) made larger donations to the CDC than those primed with negative models (e.g., people ignoring CDC guidelines). Studies have also documented concurrent relations between adults' prosocial, other-focused orientation and COVID-19 specific prosocial health behaviors. For example, Pfattheicher et al. (2020) found that an other-focused video intended to evoke empathy, which is strongly correlated with prosocial behavior (Eisenberg & Miller, 1987), predicted greater compliance with health orders than did a self-focused video educating participants about their own risk of contracting the virus (see also Abel & Brown, 2020). These studies demonstrate that, though the expression of prosocial behavior may differ in the context of a global pandemic (e.g., staying away from others while sharing resources vs. directly assisting others), similar processes (e.g., empathy) may undergird prosocial and health behavior responses to

Abbreviations: CDC, Centers for Disease Control; RGS, residualized gain score; SDQ, Strengths and Difficulties Questionnaire; YSR, Youth Self Report.



the COVID-19 pandemic. Building on these initial findings, we adopted a longitudinal research design to test prospective pathways from adolescents' security in the parent–child relationship at age 12 to their prosocial and health protective behaviors during the COVID-19 pandemic at age 15 as mediated by smaller-than-expected increases in youth's internalizing and externalizing symptoms from age 14 (1 year prior to the pandemic) to age 15 (1 month into U.S. pandemic lockdown in Spring 2020).

Adolescence represents a crucial time of opportunity and vulnerability with regard to understanding behavioral responses to the COVID-19 pandemic. Numerous articles in the popular press have documented increased community spread of COVID-19 due to adolescents who are socializing and partying and the ongoing difficulties activating adolescents' health protective orientation toward others during this crisis (e.g., “Parties delay the Start of In-Person Classes at Some U.S. High Schools;” Vigdor, 2020). Adolescence marks a period of heightened egocentrism, perceived invincibility, and risk-taking behavior (Gardner & Steinberg, 2005). Adolescent neurodevelopment is strongly implicated in these behaviors, as the reward-seeking limbic system matures faster than the planful prefrontal cortex (Steinberg, 2010). That said, risk-taking behavior is not uniformly negative (Duell & Steinberg, 2019). Indeed, prosocial behavior requires some element of risk (e.g., approaching others, even in kindness, may eventuate in social rejection), and the same neural changes that underlie adolescent risk taking behavior also promote prosocial behavior (Do et al., 2017).

Prior research supports associations of adolescents' risk assessments and risk-taking with their prosocial and health protective responses in the context of public health crises (Kim et al., 2018). For example, at the height of the AIDS epidemic, adolescents rated their own risk of contracting AIDS as lower than hypothetical characters who engaged in the same behavior (Mickler, 1993). Moreover, in this same study, greater knowledge about AIDS predicted more accurate risk assessments, but it did not predict adolescents' AIDS-preventative behaviors. Thus, paralleling Pfattheicher et al.'s (2020) suggestive evidence from adult respondents during the COVID-19 pandemic, engaging adolescents in the fight to contain COVID-19, as well as future threats to health and well-being, may be best achieved by identifying and promoting pathways toward prosocial and health protective behaviors, rather than focusing on risk education alone.

To date, only a few published studies have examined adolescents' prosocial and health protective behaviors during the COVID-19 pandemic. First, Stavrinou et al. (2020) found that adolescents' pre-pandemic prosocial tendencies (i.e., self-reported likelihood of behaving prosocially in imagined emergencies) predicted better compliance with driving-related COVID-19 restrictions (i.e.,

driving less to follow stay-at-home orders). Second, van de Groep et al. (2020) found that, amidst declines in both empathic concern and opportunities for prosocial behavior during the pandemic, adolescents were more likely to make prosocial decisions during a dictator game when playing with an imagined friend, a high-risk person, or a doctor than with an imagined unknown peer. Third, with regard to COVID-19 specific health protective behaviors, evidence suggests that prosocial motivations (e.g., wanting to protect others) are positively associated with adolescent health protective behaviors (Oosterhoff et al., 2020). Building on the descriptive contributions of these early studies, this investigation sought to address the need for *process*-oriented research aimed at identifying developmental pathways toward adolescents' prosocial and health protective behaviors during the COVID-19 pandemic.

Attachment security and adolescent behavior

Attachment theorists emphasize the contribution of sensitive and responsive caregiving exchanges to children's trust in the parent–child relationship as one from which they can venture to explore and learn (i.e., secure base) and to which they can return when threatened or vulnerable (i.e., safe haven; Ainsworth, 1989). Together, these secure base and safe haven functions comprise attachment security and inform children's emergent sense of other, self, and self-in-relationship with others (Bowlby, 1969). Over time, children's capacities for self-regulation emerge from these recurrent patterns of co-regulation in the early caregiving milieu (Lobo & Lunkenheimer, 2020). Caregivers' sensitive and containing responses to the child's affective expression teaches the child that emotion will not overwhelm the caregiver (and by extension the child) and that affect can be shareable, knowable, and tolerable (Sroufe, 1995). In this way, children with secure attachments come to recognize their emotions, trust in the presence and power of others to help them maintain or regain equilibrium in the face of challenge, and develop confidence that they, in turn, can assist others in times of duress.

Attachment security is positively related to prosocial behavior (Eisenberg et al., 2019). Recurrent experiences of successful co-regulation and confidence in one's capacity to manage one's own distress contribute to a sense that one has the power to act similarly on behalf of others (Cassidy et al., 2018). Moreover, by promoting children's capacity to process their own distress, attachment security supports an outward orientation beyond the self to appreciate the challenges faced by others (Williams & Berthelsen, 2017). These capacities for perspective-taking and empathy, coupled with confidence that one's actions can be instrumental in mitigating the distress of others, contribute to prosocial behavior.

In addition to its promotive impact on prosocial behavior, attachment security has demonstrable positive impacts on health protective behaviors. Secure attachment relationships communicate to children and adolescents that they are worthy of care (Bowlby, 1969). In turn, recent work indicates that secure attachment relationships are positively associated with self-care and health behaviors, such as meditation, eating well, and exercising (Bender & Ingram, 2018). Among adults living with diabetes, those reporting greater attachment security were more likely to engage in exercise, comply with medication schedules, and maintain better diets than those who reported attachment insecurity (Ciechanowski et al., 2004). Among adolescents, attachment security is associated with positive eating, dental, exercise, and hygiene behaviors, as well as with lower levels of health risk behaviors, such as substance use and unprotected sex (Scharfe & Eldredge, 2001). Extant research showing positive associations of attachment security with both prosocial and health behaviors, as well as the uniquely prosocial nature of health protective behaviors in the context of the COVID-19 pandemic, support our hypothesis that adolescents with secure attachment relationships will evidence greater prosocial and health protective behaviors during the COVID-19 pandemic.

Attachment security and adolescent mental health

Both internalizing problems (e.g., anxiety and depression) and externalizing problems (e.g., aggression and attention problems) increase across adolescence (Costello et al., 2011), and in the context of stressful life events (Eisenbarth et al., 2019). Whereas attachment insecurity strongly predicts adolescents' internalizing (Brumariu & Kerns, 2010) and externalizing problems (Groh et al., 2012), attachment security engenders positive mental health outcomes (Kerstis et al., 2018). Moreover, given the heightened salience of attachment relationships in contexts of threat or stress (Howard & Medway, 2004), attachment security may be especially important for understanding adolescents' mental health responses to stressful life events. In the context of the COVID-19 pandemic, these effects may be further amplified by school closures and restrictions on peer socializing that render adolescents even more dependent on parents for support and security.

The COVID-19 pandemic introduced numerous and disruptive constraints on adolescents' daily lives (e.g., remote education, cancelled sports and hobbies, isolation from friends and romantic partners), as well as elevated anxieties about economic instability and the potential for loved ones' disease contraction, illness, or death (Rajkumar, 2020). Research on stressful life

events across the lifespan highlights the importance of access to support systems for coping with adversity (Kaniasty, 2012). For adolescents, positive relationships with parents constitute a powerful source of support when navigating stressful life events (McLaughlin & Lambert, 2017), including trauma (Pynoos et al., 1999), illness (Nicholls et al., 2014), and relational disruptions (Gilbert & Sifers, 2011). Thus, attachment security may mitigate the negative mental health consequences of adverse life events by promoting adolescent's adaptive coping.

Secure attachment relationships support the development of adaptive self-regulatory capacities that render children capable of managing their distress effectively. Children's confidence in the availability of instrumental and emotional support from caregivers (i.e., secure base and safe haven attachment functions; Ainsworth, 1989) equips them with an arsenal of effective coping mechanisms to draw upon when encountering stressful situations in the absence of their attachment figure. In turn, coping is a primary determinant of psychopathology following stressful events for children and adolescents (Compas et al., 2017). Research with adolescents documents significant relations between secure attachment relationships and more positive coping strategies (Howard & Medway, 2004), as well as more positive mental health outcomes (Brumariu & Kerns, 2010). Indeed, the robust relation between adversity exposure and mental health symptoms is buffered by attachment security (Zhu et al., 2019). Thus, we hypothesized that adolescent attachment security would be associated with smaller-than-expected increases in mental health symptoms in response to the COVID-19 pandemic.

Mental health and adolescent behavior

A robust body of work demonstrates that mental health symptoms undermine prosocial and health protective behaviors (e.g., Anttila et al., 2006; Weerdmeester & Lange, 2019). Moreover, accumulating evidence indicates that the COVID-19 pandemic has contributed to increased mental health symptoms across the developmental continuum (for a review, see Rajkumar, 2020). Thus, although we anticipated a general increase in adolescents' mental health symptoms in response to the pandemic, we predicted that prior attachment security would be associated with smaller-than-expected increases in symptomatology, which, in turn, would positively predict COVID-19 prosocial and health protective behaviors.

Mental health symptoms may undermine prosocial behavior by interfering with adolescents' willingness, motivation, or ability to consider and act on behalf of others. For example, Weerdmeester and Lange (2019) found that emerging adults with social anxiety exhibited



less prosocial behavior (i.e., gave less money to social partners in an observational paradigm) following social rejection than their non-anxious counterparts. Several investigations have also documented concurrent and longitudinal negative associations between adolescents' aggression or externalizing problems and prosocial behavior (e.g., Padilla-Walker et al., 2016). For example, in a longitudinal examination of both prosocial and aggressive behaviors, Obsuth et al. (2015) found that aggressive behavior undermined prosocial behavior across a 5-year period. Thus, to the extent that attachment security promotes adolescents' effective negotiation of the stressors associated with the COVID-19 pandemic, it may also support adolescents' capacity for prosocial responding to the pandemic.

Mental health symptoms may similarly undermine adolescents' health protective behaviors by compromising youth's motivation to engage in self-care practices, their sense that they are worthy of care and protection, and/or their confidence in their ability to protect themselves from harm. In adult studies, research suggests that depression is associated with poorer dental health behaviors (Anttila et al., 2006) and less adherence to diet and exercise guidelines among diabetic patients (Katon et al., 2010). Adolescent studies reveal similar patterns, with internalizing problems predicting lower levels of physical activity (Jamnik & DiLalla, 2019) and increased health risk behaviors (e.g., smoking; Audrain-McGovern et al., 2009). Externalizing problems are also linked with a range of deviant adolescent behaviors that eventuate in negative health consequences, such as substance abuse and risky sexual behavior (e.g., Timmermans et al., 2008). For example, Blomqvist et al. (2007) found that children with externalizing problems (e.g., attention deficit hyperactivity disorder) evidenced lower adherence with common health protective behaviors, such as tooth brushing. The propensity toward risk behaviors for adolescents struggling with externalizing problems may be especially relevant to the COVID-19 pandemic because engaging in risky health behaviors is relatively easy (e.g., taking down a mask, not washing hands). Given expected negative associations of adolescents' mental health symptomatology with both prosocial and health protective behaviors, we predicted that the buffering effect of attachment security on mental health symptoms in response to the COVID-19 pandemic would promote adolescents' prosocial and health protective behaviors.

Study overview

The COVID-19 pandemic has wreaked havoc on the well-being of individuals (e.g., loss, health complications, unemployment) and communities (e.g., school shutdowns, overcrowded hospitals, economic

downturn). Moreover, these effects are non-randomly distributed with disproportionate impacts in ethnic-racial minority and low-income communities (Pirtle, 2020). At present, recommended containment efforts center on engaging behaviors to protect the health of others (Howard et al., 2021). However, a wealth of empirical evidence suggests that mental health symptoms evoked by stressful life events, such as the pandemic and attendant restrictions on daily life, undermine individuals' ability and motivation to engage in prosocial (Obradović et al., 2010) and health protective behaviors (Mezuk et al., 2010). Moreover, these effects may be magnified among adolescents who are already at heightened risk for non-adherence due to their developmentally normative propensities toward egocentrism, risk-taking, and perceived invincibility to health threats (Kim et al., 2018).

This investigation drew on an ongoing study of development and adaptation in a community sample of parent-child dyads to test a process model of adolescents' prosocial and health protective responses to the COVID-19 pandemic. First, we hypothesized that secure pre-pandemic attachment relationships with parents would predict adolescents' greater prosocial and health protective behaviors during the pandemic. Second, we hypothesized that pre-pandemic attachment security would predict smaller-than-expected increases in adolescents' mental health symptoms in response to the pandemic. Third, we hypothesized that these smaller-than-expected increases in mental health symptoms would predict adolescents' greater prosocial and health protective behaviors during the pandemic. Together, these confirmatory hypotheses posit that the relation between secure attachment relationships prior to the COVID-19 pandemic and adolescents' prosocial and health protective behaviors at its onset would be explained by smaller-than-expected increases in their mental health symptoms in response to the pandemic.

Importantly, the gender, ethnic-racial, and economic diversity of the current sample supported our exploration of predicted pathways across diverse sociodemographic groups. A wealth of data point to differential experiences of (and likely responses to) the COVID-19 pandemic across sociodemographic groups (Pirtle, 2020). The impact of COVID-19 on mental health and well-being has been particularly pronounced for girls and for ethnic-racial minority and low-income groups (Proto & Quintana-Domeque, 2021). As compared to non-Hispanic whites, ethnic-racial minorities have experienced disproportionate rates of COVID-19 contraction, hospitalization, and mortality (Hooper et al., 2020). Moreover, financial insecurities brought about by job loss and increased medical expenses have disproportionately impacted communities of color and low-income families (Hu, 2020). Thus, in addition to controlling for

gender, ethnicity/race, and family income-to-needs in the full model, we conducted follow-up multi-group analyses to evaluate the generalizability of the obtained findings across diverse sociodemographic groups.

METHOD

Participants

Participants were drawn from an ongoing longitudinal study of child development. Parent–adolescent dyads ($N = 202$; 48% females, 52% males) completed a laboratory assessment when the target youth was 12 years old ($M_{\text{age}} = 12.25$ years; $SD = 0.35$), as well as a phone assessment at age 14 ($N = 161$; $M_{\text{age}} = 14.12$ years, $SD = 0.47$), and/or an online assessment during the initial phase of COVID-19 pandemic restrictions in the United States (i.e., Spring 2020; $N = 157$; $M_{\text{age}} = 15.23$ years, $SD = 0.57$). Across waves, 180 (89.11%) dyads completed two or more of the adolescent assessments.

Adolescents in the current sample were diverse with regard to ethnicity and race (47.5% Latinx, 23.8% multiethnic-racial, 17.8% Black, 10.4% white, 0.5% Asian) and representative of the southern California community from which they were recruited (U.S. Census Bureau, 2007). Participating parents at age 12 were biological mothers (92.5%), biological fathers (3.0%), adoptive mothers (2.5%), and female extended kin (2.0%). There were no significant differences between dyads who completed all three assessment waves ($n = 145$) and those who did not ($n = 57$) on any study variables.

Procedures

Parents were recruited to participate in a longitudinal study of children's early learning and development via flyers placed in community-based childcare centers. Exclusionary criteria included children with diagnosed developmental disabilities or delays ($n = 3$), children who were unable to understand English ($n = 4$), and children outside the recruitment age range of 45–54 months (not tracked). At age 12, dyads completed a laboratory assessment, which included measures of family relationships, social behavior, and mental health. At age 14, adolescents and parents completed individual 2-h phone interviews focused on the same study constructs. About 1 year later, during April and May of 2020 (i.e., the first phase of U.S. COVID-19 pandemic restrictions), adolescents and parents completed an online survey to assess their psychological, social, and behavioral responses to the COVID-19 pandemic and attendant restrictions. At all assessments, parents were compensated with \$25–40 per assessment hour and youth received \$15–25 per hour. Informed consent and assent were obtained from the child's legal guardian and the child, respectively. All

procedures were approved by the human research review board of the participating university.

Measures

Parent–child attachment security

At age 12, adolescents reported on their attachment security with their parent using the Security Scale (Kerns et al., 2001), which assesses adolescents' perceptions of the availability and responsiveness of their parent, their tendency to seek comfort from their parent when distressed, and their ease of communication with their parent. Following the Harter (1982) *some kids ... other kids ...* format to mitigate desirability effects, adolescents indicated which of two opposing statements best described their relationship with their parent (e.g., *Some kids are really sure their parent will be there when they need them, BUT other kids are not sure if their parent will be there when they need them*), and then selected whether the statement was *really true* for them or *sort of true* for them. Each of 15 forced-choice items were scored on a 4-point continuum from 4 (*secure option is really true*), 3 (*secure option is sort of true*), 2 (*insecure option is sort of true*), and 1 (*insecure option is really true*). Responses were composited across the 15-items with higher scores indicating more attachment security (Cronbach's $\alpha = .730$). Prior research supports the validity of the Security Scale in diverse samples (Brumariu et al., 2018).

Mental health symptoms

At both the age 14 and COVID-19 (age 15) assessments, adolescents self-reported on their mental health symptoms using the Youth Self Report (YSR) of the Achenbach test battery (Achenbach & Rescorla, 2014). The YSR is a standardized measure that assesses self-reported problems across 119 items on a scale from 0 (*not true*) to 2 (*very true or often true*). Analyses in this study were conducted using the total problems subscale, which includes nine subscales (i.e., withdrawn, somatic complaints, anxious/depressed, thought problems, social problems, attention problems, delinquent behavior, aggressive behavior, identity problems; Cronbach's $\alpha_{\text{age 14}} = .957$; Cronbach's $\alpha_{\text{COVID-19}} = .949$). The YSR evidences strong criterion validity in both clinical and community samples from diverse backgrounds (Achenbach et al., 2001).

All analyses were conducted using a residualized gain score (RGS) measure of total mental health symptoms. We regressed the t -score for total problems during COVID-19 on the t -score for total problems at age 14 to produce a standardized RGS representing adolescents' relative mental health symptom changes in response to the COVID-19 lockdown. Positive scores indicated



larger-than-expected increases in mental health symptoms and negative scores indicated smaller-than-expected increases in mental health symptoms based on the adolescent's initial symptomatology at age 14. Furthermore, we added the unstandardized regression coefficient for this association ($B = .093$) to the resultant standardized RGS to indicate the actual magnitude of change in symptoms (rather than the relative change offered by a standardized RGS alone). Importantly, we tested all associations using the internalizing and externalizing broadband scales separately; however, given that the pattern of relations replicated across symptom domains, we retained the total problems RGS adjusted for average symptom change in the current analyses.

Prosocial behavior

At age 12, parents reported on their adolescents' prosocial behavior using the five-item prosocial subscale of the Strengths and Difficulties Questionnaire (SDQ; Muris et al., 2003). Parents indicated how true each statement (e.g., *my child is helpful if someone is hurt, upset, or ill*) was about the target child on a 5-point scale from 1 (*never true*) to 5 (*always true*; Cronbach's $\alpha = .757$). During the COVID-19 assessment at age 15, adolescents reported on their prosocial behaviors since the beginning of the pandemic using the same SDQ subscale, as well as one additional item specific to COVID-19 (i.e., *I am finding ways to be helpful in my home or community in response to coronavirus/COVID-19 [e.g., doing more chores, babysitting siblings, making masks for hospital workers]*; Cronbach's $\alpha = .810$).

COVID-19 health protective behaviors

During the COVID-19 assessment at age 15, adolescents reported on their compliance with COVID-19 health protective behaviors tapping hygiene (e.g., *washed hands more often than usual*), social distancing (e.g., *avoided shaking hands and hugging when greeting people*), and activity restriction (e.g., *avoided public places like parks or beaches*) across 14 questions on a 5-point scale from 1 (*not at all*) to 5 (*always*) since the beginning of the pandemic (Cronbach's $\alpha = .900$).

Family income-to-needs

At age 12, family financial resources were determined based on the caregiver's reported household income, which included all financial contributions to the household (e.g., salary, child support), divided by the appropriate poverty threshold for the household size and number of children under 18 in the home (U.S. Census Bureau, 2016).

Data preparation and analytic plan

All analyses were performed using the lavaan package in RStudio (Rosseel, 2012). Of the 202 participating adolescents, 8 (3.96%) were missing attachment data because they did not complete the attachment measure at age 12. Thirty-three (16.34%) adolescents were missing age 14 data on mental health symptoms because they did not complete the age 14 assessment and 2 (0.99%) additional youth were missing data because they did not complete the YSR at the age 14 assessment. Forty-nine (24.25%) adolescents were missing data on mental health symptoms, prosocial behavior, and health protective behaviors during the COVID-19 assessment because they only completed partial assessments ($n = 3$), because only their parent completed the assessment ($n = 6$), or because neither the parent nor child completed the assessment ($n = 40$). One (0.005%) additional adolescent was missing data on prosocial and health protective behaviors during COVID-19 because they did not complete those portions of the assessment. Missing data were estimated using the full information maximum likelihood procedure in RStudio as supported by Little's missing completely at random test, $\chi^2(1230) = 265.735$, $p = 1.000$. Importantly, all patterns replicated in both the raw (i.e., listwise deleted) and estimated data.

Mediation analyses completed in RStudio yielded 95% bootstrapped confidence intervals (CIs). Bootstrapping is a non-parametric technique that minimizes the influence of non-normality across study variables, and yields a more reliable estimation of mediation than Sobel's (1982) test, particularly in smaller samples (Preacher et al., 2007). Bootstrapping allows for direct estimation of mediation and mitigates power problems due to the asymmetric and non-normal sampling distribution of indirect effects (Edwards & Lambert, 2007). The path model controlled for child gender, ethnicity-race, family income-to-needs, and prior prosocial behavior. In addition, follow-up multi-group analyses evaluated the generalizability of the obtained findings using Satorra's (2000) chi-square difference test to compare freed versus fixed parameter models by gender, ethnicity/race, and family income-to-needs.

RESULTS

Descriptive and bivariate analyses

Descriptive statistics and bivariate correlations for study variables are reported in Table 1. On average, adolescents reported more mental health problems during the pandemic than 1 year prior ($M_{\text{age 14}} = 45.323$; $M_{\text{age 15/COVID-19}} = 49.083$; $t = 2.795$, $p = .006$), and this pattern was consistent for both internalizing ($M_{\text{age 14}} = 45.790$; $M_{\text{age 15/COVID-19}} = 50.632$; $t = 3.642$, $p < .001$) and externalizing ($M_{\text{age 14}} = 44.677$; $M_{\text{age 15/COVID-19}} = 47.737$; $t = 2.415$,

TABLE 1 Descriptive statistics and correlations among study variables

Study variable	M (SD)	1	2	3	4	5	6	7	8	9	10	11
1. Family income-to-needs (age 12)	2.35 (1.51)	—										
2. Prosocial behavior (age 12)	3.37 (0.59)	-.015	—									
3. Attachment security (age 12)	3.10 (0.35)	.144	.176*	—								
4. Internalizing symptoms (age 14)	45.82 (10.48)	-.144	.027	-.165*	—							
5. Externalizing symptoms (age 14)	44.47 (10.89)	.073	-.006	-.114	.654**	—						
6. Total problems (age 14)	45.31 (10.88)	-.090	-.004	-.151	.897**	.861**	—					
7. Internalizing symptoms (COVID-19; age 15)	51.12 (11.91)	-.066	.018	-.301**	.102	.087	.091	—				
8. Externalizing symptoms (COVID-19; age 15)	48.41 (10.55)	-.030	-.051	-.277**	.060	.062	.062	.673**	—			
9. Total problems (COVID-19; age 15)	49.80 (11.87)	-.050	-.003	-.296**	.090	.070	.086	.918**	.858**	—		
10. Total problems (RGS)	0 (1)	-.059	.052	-.341**	.013	-.005	.000	.918**	.849**	.996**	—	
11. Prosocial behavior (COVID-19; age 15)	2.33 (0.48)	-.035	.217*	.181*	-.148	-.065	-.113	-.232**	-.254**	-.252**	-.232**	—
12. Health protective behavior (COVID-19; age 15)	4.10 (0.78)	-.198*	.190*	.221**	-.038	-.006	.019	-.256**	-.371**	-.308**	-.295**	.320**

Note: RGS = adjusted residualized gain score of adolescents' mental health symptoms during COVID-19 on pre-pandemic mental health symptoms.

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

$p = .017$) problems. A multivariate analysis of variance evaluated gender, ethnicity/race and interactive patterns across family income-to-needs, attachment security, mental health symptoms, age 12 prosocial behaviors, and COVID-19 prosocial and health protective behaviors. There was a significant main effect of gender (Wilks' $\lambda = .634, p < .001$), such that girls evidenced greater prosocial behavior at age 12 ($F = 3.109, p = .001$) and more health protective behaviors ($F = 2.308, p = .034$) during the COVID-19 pandemic. However, there was no significant main effect of ethnicity/race (Wilks' $\lambda = .930, p = .895$), nor was there a significant gender \times ethnicity/race interaction (Wilks' $\lambda = .894, p = .639$).

At the bivariate level, family income-to-needs at age 12 was negatively associated with COVID-19 health protective behaviors at age 15. Parent reports of adolescents' prosocial behaviors at age 12 were positively associated with adolescents' reports of concurrent parent-child attachment security and with later prosocial and health protective behavior during COVID-19. Attachment security was negatively associated with adolescents' reported mental health systems at age 14 and during COVID-19, as well as with the mental health symptom RGS such that adolescents who endorsed more security in the parent-child relationship at age 12 evidenced smaller-than-expected increases in mental health symptoms from pre-COVID-19 at age 14 to the first weeks of the pandemic 1 year later. Attachment security was positively related to prosocial and health protective behaviors during COVID-19. At ages 14 and 15, internalizing and externalizing problems were positively correlated with total problems, and with one another concurrently. Both internalizing and externalizing problems during COVID-19 were negatively correlated with concurrent prosocial and health protective behaviors. Prosocial behavior during COVID-19 was negatively associated with the mental health symptom RGS from pre-COVID-19 to the pandemic lockdown and positively associated with COVID-19 health protective behaviors.

Mediation analyses

Table 2 depicts parameter estimates and 95% bootstrapped CIs for the path analysis. Female gender predicted larger residualized gains in mental health symptoms from age 14 to the onset of the COVID-19 pandemic, as well as more COVID-19 prosocial and health protective behaviors. Family income-to-needs negatively predicted COVID-19 health protective behaviors. Prosocial behavior at age 12 positively predicted prosocial behavior during COVID-19. Adolescent attachment security at age 12 negatively predicted residualized gains in mental health symptoms, and residualized gains in mental health symptoms negatively predicted both COVID-19 prosocial and health protective behaviors. As shown in Figure 1, there was a significant



TABLE 2 Indirect effect of attachment on prosocial and health protective behavior during COVID-19 through changes in adolescent mental health symptoms

Effect	<i>B</i>	Bootstrapped <i>SE</i>	<i>z</i>	<i>p</i>	95% CI bias corrected	
					LLCI	ULCI
Child gender → mental health symptoms RGS	.398	.159	2.507	.012	.087	.710
Child gender → prosocial behavior (COVID-19)	.185	.076	2.449	.014	.037	.333
Child gender → health protective behavior (COVID-19)	.387	.119	3.261	.001	.155	.620
Child ethnicity/race → mental health symptoms RGS	-.220	.155	-1.416	.157	-.525	.085
Child ethnicity/race → prosocial behavior (COVID-19)	.055	.073	0.757	.449	-.087	.198
Child ethnicity/race → health protective behavior (COVID-19)	-.012	.114	-0.109	.913	-.236	.211
Family income-to-needs (age 12) → mental health symptoms RGS	-.013	.061	-0.213	.831	-.132	.106
Family income-to-needs (age 12) → prosocial behavior (COVID-19)	-.017	.028	-0.599	.549	-.073	.039
Family income-to-needs (age 12) → health protective behavior (COVID-19)	-.101	.044	-2.299	.022	-.187	-.105
Prosocial behavior (age 12) → mental health symptoms RGS	.058	.136	0.424	.671	-.209	.325
Prosocial behavior (age 12) → prosocial behavior (COVID-19)	.124	.063	1.968	.049	.001	.248
Prosocial behavior (age 12) → health protective behaviors (COVID-19)	.132	.099	1.344	.182	-.062	.327
Attachment (age 12) → mental health symptoms RGS	-1.035	.236	-4.377	<.001	-1.498	-.571
Mental health symptoms RGS → prosocial behavior (COVID-19)	-.116	.042	-2.743	.006	-.199	-.033
Mental health symptoms RGS → health protective behavior (COVID-19)	-.251	.066	-3.770	<.001	-.381	-.120
Attachment security → COVID-19 prosocial behavior (direct)	.166	.120	1.388	.165	-.068	.400
Attachment security → COVID-19 health protective behavior (direct)	.256	.188	1.361	.174	-.112	.624
Attachment security → mental health symptoms RGS → prosocial behavior (indirect)	.120	.051	—	—	.019	.221
Attachment security → mental health symptoms RGS → health protective behavior (indirect)	.259	.090	—	—	.083	.436

$R^2_{\text{prosocial}} = .167$; $R^2_{\text{health protective}} = .215$; Cohen's $f^2_{\text{prosocial}} = .201$; Cohen's $f^2_{\text{health protective}} = .274$

Note: RGS = adjusted residualized gain score of adolescents' mental health symptoms during COVID-19 on pre-pandemic mental health symptoms. Abbreviations: LLCI, lower limit confidence interval; SE, standard error; ULCI, upper limit confidence interval.

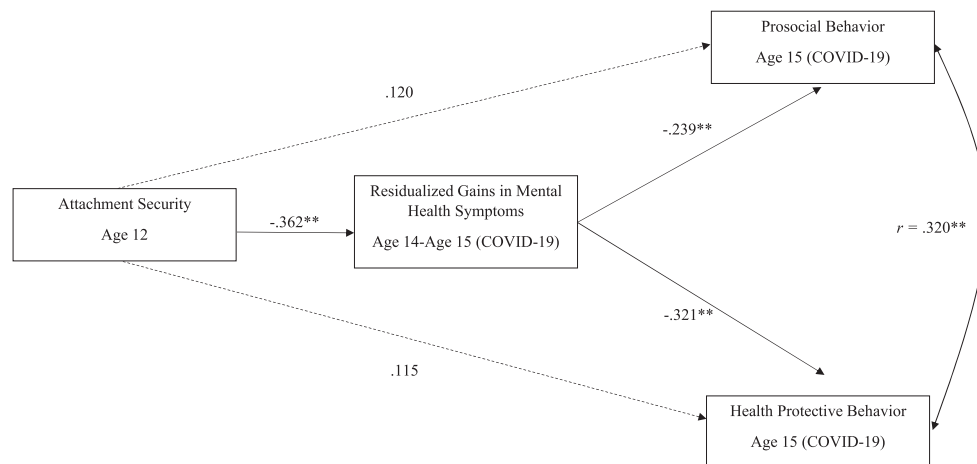


FIGURE 1 Multiple regression model of the influence of parent-adolescent attachment on prosocial and health protective behavior via residualized gains in mental health symptoms. Estimates are standardized regression coefficients. $^{**}p < .01$

indirect path from adolescent attachment security to prosocial behavior during the COVID-19 pandemic via smaller residualized gains in mental health symptoms ($B = .120$, $SE = .051$, 95% CI [.019, .221]), and a similar indirect path from adolescent attachment security to COVID-19 health protective behaviors via smaller residualized gains in mental health symptoms ($B = .259$, $SE = .090$, 95% CI [.083, .436]). As mentioned earlier, separate analyses examining residualized gains in either internalizing or externalizing symptoms fully replicated these findings. Follow-up analyses comparing the path model across sociodemographic groups revealed no significant differences by gender ($\chi^2[5] = 10.049$, $p = .074$), ethnicity/race (i.e., Latinx vs. non-Latinx; $\chi^2[5] = 9.513$, $p = .090$), or family income -to-needs (median split; $\chi^2[5] = 8.501$, $p = .131$).

DISCUSSION

This investigation drew on an ongoing longitudinal study of development and adaptation in a sizable and sociodemographically diverse community sample of parent-adolescent dyads to advance our understanding of whether and how parent-child attachment security may contribute to adolescents' prosocial and health protective responses to the COVID-19 pandemic and, by extension, public health crises more broadly. Adolescents who reported more secure attachment relationships at age 12 evidenced smaller-than-expected increases in mental health symptoms from age 14 (prior to the pandemic) to age 15 (during the first phase of U.S. pandemic). Moreover, attachment security predicted increased prosocial and health protective behaviors during the first weeks of the pandemic, and these relations were mediated by the promotive effect of attachment security on adolescents' mental health responses to the pandemic.

These findings reveal an important pathway through which adolescents can evidence surprising increases in prosocial behaviors following stressful life events, such as the disruptions of the spring 2020 COVID-19 restrictions in the United States. Of particular relevance to the current health crisis, these results also demonstrated that attachment security may have supported adolescents' mental health and adherence to COVID-19 prosocial health protective behavior guidelines, which is of paramount importance to containing this pandemic. Although efforts to modify attachment itself may be ill-suited to the kind of rapid intervention necessitated by the current health crisis, parenting practices are readily modifiable (even after just a few sessions) in ways that engender children's sense of felt security, capacity to manage stressful life events, and engagement in positive behaviors toward self and others (Mikulincer & Shaver, 2007). Thus, parent-adolescent relational dynamics may be a promising site for interventions aimed at promoting adolescents' prosocial and health protective behaviors in

the context of the current global health crisis, as well as for preparing youth for future stressful life events.

Although the overall obtained effects were modest in magnitude, their practical impact is magnified by the scope of the population to which they apply (Funder & Ozer, 2019). Moreover, post hoc comparative analyses across sociodemographic groups defined by gender, ethnicity/race, and family income-to-needs supported the generalizability of these patterns across adolescents from varying backgrounds. The modest relation between prosocial measures across time likely reflects the shift from parent reports at age 12 to adolescent reports at age 15, but the low correlations among mental health symptoms across time were somewhat surprising. Although this may reflect the unique assessment context necessitated by the COVID-19 pandemic restrictions (i.e., the shift from in-person to online data collection), we observed similarly modest associations among mental health symptoms from ages 12 to 14. Thus, these correlations likely reflect the shifting nature of symptomatology across adolescence and further highlight the potential for interventions to redirect symptomatic pathways.

Relative to the generally modest effect sizes in this study, the relation of early-adolescent attachment security to adolescents' mental health responses to the COVID-19 pandemic (i.e., the mental health RGS) was very large. Moreover, at the bivariate level, relations between attachment security and age 14 mental health symptoms were smaller than those between attachment security and age 15/COVID-19 mental health symptoms. Although these findings may appear surprising given the longer time elapsed to age 15, the pattern of results is consistent with the tenets of attachment theory. As noted earlier, the attachment system is designed to be activated most strongly in contexts of threat (Howard & Medway, 2004). Thus, we would expect stronger relations between attachment security and adolescents' mental health symptoms in the context of the pandemic crisis (age 15) as compared to less stressful pre-pandemic contexts (age 14). Moreover, it is likely that social distancing restrictions that prevented adolescents from accessing outside supports, such as peers, teachers, and coaches, may have increased the salience of attachment security to parents (Pabilonia, 2020).

Consistent with attachment theory and research (Sroufe et al., 1999), secure parent-child attachments likely equip adolescents with the capacity to recognize and understand their own emotions, to self-regulate in periods of distress, and to turn their attention and effort toward the needs of others in ways that enable prosocial behavior and, given the uniquely prosocial nature of adherence to CDC guidelines in the context of COVID-19, promote health protective behavior. The inclusion of residual gains in mental health symptoms rendered the direct associations between attachment security and adolescents' prosocial and health protective behaviors nonsignificant. However, it remains likely that attachment

security promotes prosocial and health protective behaviors during COVID-19 via other mechanisms beyond supporting adolescents' capacity to cope with the stress of the pandemic (Rucker et al., 2011). For example, attachment security may support adolescents' capacity to decenter from their own experiences in ways that allow them to appreciate and empathize with the risks faced by others in their social milieu (i.e., empathy; Cassidy et al., 2018). In turn, adult studies have shown that empathy is positively related to both prosocial (van de Groep et al., 2020) and health protective (Pfattheicher et al., 2020) behaviors in the context of the current pandemic, and we expect that relations between empathy and COVID-19 prosocial and health protective behaviors in adolescence would be similarly positive. That said, as discussed later, it may also be that prosocial behaviors reciprocally influenced adolescents' mental health symptoms in ways that could not be examined with these data.

Although this investigation focused on adolescents' attachment to parents, other attachment relationships, such as those with peers or romantic partners, may be important for understanding prosocial (Brown & Larson, 2009) and health protective (Chung et al., 2017) behaviors. However, the unique threats of COVID-19 to adults as compared to children and teens (Lee et al., 2020), coupled with the marked disruptions in peer connections (Ellis et al., 2020) and the heightened intensity of parenting and parent-child relationships due to the COVID-19 restrictions (Pabilonia, 2020), justified our current focus on adolescents' felt security in the parent-adolescent relationship. In the context of future stressors, efforts to understand adolescents' prosocial and health behaviors will benefit from greater consideration of multiple attachment relationships. Indeed, a wealth of literature on adolescent risk assessment and decision-making points to the powerful influence of peer relationships on adolescents' risk-taking behaviors (Gardner & Steinberg, 2005). As pandemic restrictions recede, peer influences may take on increased salience, especially with regard to adolescents' willingness to receive the COVID-19 vaccine.

Strengths and limitations

This study benefitted from a rich data set collected prior to and across the start of the COVID-19 pandemic with a large and sociodemographically diverse sample of adolescent-parent dyads. Notwithstanding these strengths, however, several limitations qualify the interpretation of the current findings. For example, the obtained relations may have been inflated by common method variance, since most study variables were reported by the participating adolescents (Campbell & Fiske, 1959).

Although adolescents endorsed varying levels of prosocial and health protective behaviors during the

COVID-19 lockdown, this study lacked observational assessments to verify the validity of these reports. Furthermore, our measure of health protective behaviors did not include what is now recognized to be the most powerful tool against COVID-19 transmission—mask wearing—because it was not part of the CDC guidelines at the time these data were collected.

It is important to note that prosocial behaviors are particularly restricted due to the unique constraints of this pandemic, yet the current investigation utilized a general measure of prosocial behavior, which captured adolescents' tendency to care, help, and share with others, particularly peers. Although we added one item tapping COVID-19 specific prosocial behavior, the current measure may not have adequately captured the totality of adolescents' prosocial responses to the pandemic. Indeed, some traditional prosocial expressions, such as sharing food with a peer, would directly violate COVID-19 health protective behaviors, such as maintaining social distance. Efforts to promote adolescents' prosocial behavior in the context of this and future health crises must consider necessary alterations in prosocial expressions to ensure the safety of all involved. Likewise, future investigations should comprehensively assess expressions of COVID-19 specific prosocial behaviors, such as grocery shopping for vulnerable others, making masks, or raising money or awareness for struggling businesses and families.

Our inclusion of prior prosocial behavior as a covariate in these analyses strengthened statistical support for our directional hypotheses regarding attachment security, mental health, and prosocial responses to COVID-19. However, we were not able to include an exact control for prosocial behavior due to the absence of a self-report measure of the construct at age 12. Furthermore, we did not assess health protective behaviors in this study prior to the onset of the COVID-19 pandemic. These limitations are noteworthy because, consistent with broader transactional models of development (Sameroff, 2009), we expect that children's prosocial and health behaviors might evoke and/or reinforce parental expressions of warmth and support, which themselves engender greater attachment security and socioemotional wellbeing. Empirical investigations suggest that relations among parent-child relationship factors and prosocial behavior are reciprocal (e.g., Padilla-Walker et al., 2012). Likewise, evidence suggests that prosocial behavior might promote mental health (Haroz et al., 2013), just as mental health symptoms may influence prosocial behavior (Weerdmeester & Lange, 2019). Indeed, several studies find evidence for enhanced mental health outcomes among individuals who help others through shared struggles (i.e., the Helper Therapy Principle; Riessman, 1965), such as with alcoholism (Pagano et al., 2011) and suicidality (Greidanus & Everall, 2010). Ongoing research that includes multiple waves of data across the COVID-19 pandemic are needed to elucidate these transactional dynamics fully.

CONCLUSIONS AND IMPLICATIONS

At present, COVID-19 health protective behaviors, particularly mask wearing, provide as much or greater protection to others as compared to oneself (e.g., Howard et al., 2021). Moreover, initial studies point to the importance of activating *other-* rather than *self-*oriented motivations to promote adherence to these uniquely prosocial CDC health guidelines (Abel et al., 2020; Oosterhoff et al., 2020; Pfattheicher et al., 2020). Given the evident challenges of activating these motivations among adolescents (“Parties delay the Start of In-Person Classes at Some U.S. High Schools;” Vigdor, 2020), our findings have significant implications for understanding how parent–adolescent attachment security can promote adolescents’ prosocial and health protective behaviors during the current COVID-19 crisis, and likely in the context of future threats to health and well-being. Moreover, the role of adolescents’ mental health responses to the pandemic in explaining these pathways further elevates the need for the provision of timely and contextually responsive mental health supports to adolescents and their families during this uniquely stressful time.

A central assumption of this investigation was that, as with adult populations (Pfattheicher et al., 2020), adolescents who were more prosocial during COVID-19 would also abide more closely to the CDC health protection guidelines. In support of this assertion, we found strong concurrent relations between adolescents’ reports of prosocial and health protective behaviors, as well as significant pathways to COVID-19 prosocial health protective behaviors from parent–adolescent attachment security through adolescents’ favorable mental health responses to the pandemic.

Notwithstanding potentially reciprocal relations of adolescents’ prosocial and health protective behaviors with their mental health, as well as of adolescents’ mental health with parent–child attachment security, these findings suggest that parent–child attachment security promotes both mental health and behavioral responses to the COVID-19 pandemic, with mental health further contributing to adolescents’ prosocial and health protective behaviors. Thus, interventions to promote the well-being of adolescents (and others) during this global crisis should consider the quality of parent–adolescent relationships with regard to children’s felt security and safety therein. A wealth of research indicates that attachment-based interventions can promote mental health and prosocial behavior across the developmental continuum (for a review, see Mikulincer & Shaver, 2007). Even if the time scale of such interventions extends beyond the current pandemic, these efforts will maximize opportunities to engage prosocial action and health protection in the context of future threats to health and well-being.

In addition to supporting adolescents’ mental health by strengthening attachment security, or

improving parent–child relational dynamics in the shorter term (Mikulincer & Shaver, 2007), interventions that target adolescents’ mental health symptoms directly may promote their motivation and capacity to engage in prosocial and health protective behaviors. Although it is reasonable to expect an increase in mental health problems in the context of a major stressor (e.g., McLaughlin & Lambert, 2017), efforts to alleviate these symptoms require complex and flexible solutions, particularly given the unpredictable course of this pandemic and the multiple problems facing individuals and communities (e.g., job loss, decreased access to mental healthcare, financial burden associated with hospitalization; Ransing et al., 2020). Moving forward, research efforts should focus on developing feasible and effective interventions to improve mental health among adolescents during the COVID-19 pandemic. These efforts may promote vaccine uptake as a prosocial health protective behavior, and may also serve to mitigate potential elevations in social and health anxiety as pandemic restrictions ease (Zheng et al., 2020). In the context of prior community-level stressors, such as war, large-scale intervention efforts (e.g., group therapy conducted in schools and communities) have positively influenced youths’ mental health (e.g., Scholte et al., 2011), and may be similarly effective in the context of the current pandemic.

As with many social movements across history, from civil rights to environmental justice (Costanza-Chock, 2012), adolescents have the potential to be powerful agents of social change in response to the COVID-19 pandemic. Indeed, the very same neurobiological changes that render adolescents prone to increased risk-taking behavior (e.g., development of the ventral striatum and dopaminergic reward systems) also increase the likelihood of prosocial actions in adolescence (Do et al., 2017). Thus, by supporting our adolescents, we may engage our strongest allies, not only in the ongoing fight to contain the COVID-19 pandemic, but also in future efforts to negotiate threats to public health and well-being.

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ORCID

Brianne R. Coulombe  <https://orcid.org/0000-0002-6185-251X>
Tuppert M. Yates  <https://orcid.org/0000-0002-0907-8520>

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