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Interpersonal Relationships and Callous-Unemotional Traits During Adolescence and Young Adulthood: An Investigation of Bidirectional Effects in Parent, Peer, and Romantic Relationships

Erin P. Vaughan[1] , Paul J. Frick[1], Emily L. Robertson[2] ,
James V. Ray[3], Laura C. Thornton[4] , Tina D. Wall Myers[5],
Laurence Steinberg[6,7], and Elizabeth Cauffman[8]
[1]Department of Psychology, Louisiana State University; [2]Center for Children and Families, Florida International
University; [3]Department of Criminal Justice, University of Central Florida; [4]Division of Health and Environment,
Abt Associates, Austin, Texas, USA; [5]Eastern Louisiana Mental Health System, Louisiana Department of Health,
Jackson, Louisiana, USA; [6]Department of Psychology and Neuroscience, Temple University; [7]Center for Social
Research and Humanities, King Abdulaziz University; and [8]Department of Psychological Science,
University of California, Irvine

Abstract

Callous-unemotional (CU) traits, or limited prosocial emotions, designate an important subgroup of individuals with conduct problems. These traits are associated with low quality of interpersonal relationships, but limited research has investigated the direction of these effects. In the present study, we investigated the longitudinal associations between CU traits and warmth with parents, friends, and romantic partners over a 5-year span in a sample of justice-involved adolescent and young-adult males. Random intercept cross-lagged panel analyses indicated that CU traits predicted reductions in parental warmth throughout adolescence and young adulthood. Negative bidirectional associations between CU traits and romantic warmth were present during young adulthood. However, although individuals with higher CU traits had less warm friendships, there were no within-individuals predictive associations over time. Findings indicate that CU traits are predictive of problematic interpersonal relationships, and these relationships need to be considered in intervention, including focusing on improving romantic warmth in young adulthood.

Keywords

Conduct problems and antisocial behavior are behaviors that violate the rights of others or major societal norms and are one of the most common reasons that children and adolescents are referred for mental-health treatment (Kimonis et al., 2014). Youths who exhibit these behaviors face difficulties in many aspects of their lives, including justice-system involvement and poor social, educational, occupational, and psychological outcomes (Odgers et al., 2007). Given the negative societal and personal consequences of antisocial

behavior, a great deal of research has tried to identify the different causal pathways that precede it.

A marker for one such pathway is the presence of elevated callous-unemotional (CU) traits, which are closely related to the affective dimension of psychopathy and the affective components of conscience (Frick

Corresponding Author:
Erin P. Vaughan, Department of Psychology, Louisiana State University
Email: evaugh7@lsu.edu

et al., 2014; Waller et al., 2020). These traits are defined by a lack of guilt, lack of empathy, lack of concern about performance in important tasks, and shallow or deficient affect (Frick & Ray, 2015). The presence of CU traits predicts a more severe and stable pattern of antisocial behavior (Frick et al., 2005; McMahon et al., 2010), characterized by more severe and premeditated aggression (Lawing et al., 2010; Marsee & Frick, 2007). CU traits also seem to designate a group of antisocial youths who have stronger genetic influences to their antisocial behavior as well as distinct cognitive and emotional characteristics, all of which could suggest a distinct etiology to their behavior problems (for a review, see Frick et al., 2014). Furthermore, children and adolescents with elevated CU traits show poorer outcomes in traditional interventions for conduct problems (Hawes et al., 2014; Wilkinson et al., 2016). The findings of this research led to the inclusion of CU traits in the major diagnostic criteria of conduct disorders, which now include a specifier of "limited prosocial emotions" (American Psychiatric Association [APA], 2013; World Health Organization [WHO], 2019).

Interpersonal Relationships, Conduct Problems, and CU Traits

The ability to form and maintain close, supportive, and satisfying social relationships is a key aspect of healthy socioemotional functioning that is often impaired across relationship domains for children and adolescents who exhibit conduct problems and CU traits. For example, antisocial youths often have relationships with parents that are defined by a negative and coercive cycle in which parents use harsh methods in an attempt to reduce the child's behavior problems and the child inadvertently learns that negative behavior can be effective in influencing the parenting they receive (Patterson et al., 1989). The individual then learns to use negative control strategies with peers and romantic partners, resulting in lower-quality friendships and more conflict in romantic relationships (Bagwell & Coie, 2004; Woodward et al., 2002). Furthermore, research on interpersonal functioning and conduct problems has found that the social impairment exhibited by these individuals is often part of a reciprocal process in which poor relationship quality predicts increases in conduct problems and conduct problems predict decreases in relationship quality (Hipwell et al., 2008; Orue & Calvete, 2011; Pinquart, 2017). In fact, most key theories on interpersonal relationships and their connections to the development of antisocial behavior (i.e., attachment theory, social-learning theory) rely on an assumption of reciprocal or bidirectional influences (Shaw & Bell, 1993).

In light of research on the differing trajectories of antisocial behavior, it is not surprising that antisocial individuals who exhibit elevated levels of CU traits also show unique impairments in social relationships because of their affective and interpersonal deficits (Matlasz et al., 2022; Wagner et al., 2020). In fact, research with children who go on to display elevated CU traits has found that even from a very young age, these youths show reduced motivation to engage socially with others, which may explain why they do not attend to caregivers' social cues or show empathic concern to the distress of others (for reviews, see Frick & Kemp, 2021; Viding & McCrory, 2019). Although broad deficits in social engagement have been associated with CU traits, research has largely focused on problems in the parent–child relationship.

CU Traits and the Parent–Child Relationship

Whereas early findings regarding the association between parenting and CU traits suggested that individuals with elevated CU traits may not be as susceptible to the influences of parenting (Wootton et al., 1997), more recent studies have suggested that these findings may differ depending on the aspect of parenting studied (Crum et al., 2015). A review of 30 studies concluded that several dimensions of parenting predicted changes in CU traits from early childhood to adolescence (Waller et al., 2013). A lack of parental warmth in particular has emerged as a key contributor to the development of CU traits (Clark & Frick, 2018). For example, several studies that compared warmth with other parenting dimensions (i.e., harshness and hostility) found that parental warmth shows the most consistent negative associations with CU traits, even when controlling for the child's conduct problems (Goulter et al., 2020; Waller et al., 2018).

Unfortunately, much of the work testing the association between CU traits and parental warmth has been cross-sectional, and when longitudinal studies have been conducted, they often have not considered the potential for bidirectional effects. However, there are theoretical reasons to believe that there may be bidirectional relations between parental warmth and CU traits. For example, positive and cooperative parenting is thought to encourage conscience development and the internalization of moral standards and therefore protect the child against the development of CU traits (Kochanska, 1997). A warm parent–child relationship also facilitates identification with the parent and, early in development, encourages the understanding of other individuals' perspectives (MacDonald, 1992). According

to attachment theory, positive and attentive parenting cultivates the development of a secure attachment, which creates positive expectations for future social interactions and greater awareness of others' emotions, both of which encourage empathetic and prosocial responding (Stern & Cassidy, 2018). There is also reason, however, to believe that a child's lack of empathy and guilt may cause parents to behave less warmly toward their child. A fundamental component of both social-learning and attachment theory is that both parent and child reciprocate the positive interaction; if the child does not express emotion and empathy toward the parent or guilt for wrongdoings, this behavior could lead to reductions in the parent's use of warm and positive parenting strategies (Gross et al., 2017; MacDonald, 1992; Shaw & Bell, 1993). In fact, in the few studies to consider bidirectional associations between warm parenting and CU traits, both child-driven and parent-driven effects were found (Hawes et al., 2011; Muratori et al., 2016; Waller et al., 2014). Note, however, that none of these studies to date have investigated this question after removing between-individuals associations, which can lead to erroneous conclusions regarding directional effects (Hamaker et al., 2015). That is, typical longitudinal tests do not separate variance because of associations between individuals or trait-level associations across individuals (e.g., people higher on CU traits are more likely to have relationships lower in warmth across development) from changes within the individual (e.g., changes in an individual's level of CU traits at an earlier time point predict changes in warmth in that individual's relationships at a later time point; Berry & Willoughby, 2017). Furthermore, the association between CU traits and relationship quality has not been extensively studied in other social relationships, such as peer and romantic relationships.

Peer Relationships and CU Traits

Although parents are often viewed as a key socializing influence on the development of prosocial emotions and behavior, research supports the importance of same-age peers as sources of support and predictors of socioemotional adjustment, especially during adolescence (Buhrmester, 1990; Furman & Buhrmester, 1992). In fact, meta-analytic findings have shown that during adolescence, the quality of peer relationships is more strongly related to prosocial development than the quality of parent relationships (Boele et al., 2019). Thus, the relation between peer relationships and CU traits is an important focus of research. To date, the amount of research on peer relationships has been limited, but it has shown that children with elevated CU traits seem be less well liked by peers (Haas et al.,

2018; Wagner et al., 2020; Waller et al., 2017). However, despite difficulties with peers, children with CU traits are still able to form friendships (Muñoz et al., 2008), but these friendships tend to be of lower quality and characterized by less stability, support, intimacy, and overall satisfaction (Backman et al., 2018; Fanti et al., 2017; Haas et al., 2018; Matlasz et al., 2022; Muñoz et al., 2008).

The directionality of the association between impaired peer relationships and CU traits has not been extensively studied, however. As with parenting relationships, there are theoretical reasons to hypothesize bidirectional effects between CU traits and relationships with peers. First, the presence of high-quality, close friendships provides opportunities to practice prosocial behavior and motivates empathic responding (Amato, 1990; Padilla-Walker et al., 2015), possibly by strengthening an individual's attachment bonds and expectations that were developed earlier in childhood with parents (Fraley & Davis, 1997). Therefore, a lack of these relationships could exacerbate risk for CU traits. However, CU traits may also lead to problems in peer relationships. Individuals with CU traits have been found to value negative social goals, such as revenge, dominance, and forced respect, rather than collaborative friendship building (Pardini, 2011), all of which could lead to the child with elevated CU traits being viewed as "mean" by peers (Matlasz et al., 2022). Furthermore, close friendships, like parenting relationships, also rely on a degree of reciprocity in affection and support (MacDonald, 1992). Thus, if an individual with CU traits fails to offer these to a friend, the friendship may deteriorate in quality or eventually be terminated.

Only one study to date has investigated the potential bidirectional associations between CU traits and peer-relationship quality. In a sample of justice-involved adolescents, Miron et al. (2020) found negative bidirectional effects between friendship quality and CU traits over a 6-month period. However, in a second 6-month interval, friendship quality predicted reduced future CU traits but not vice versa. As with research on parenting, though, it would be important to investigate within-individuals changes in CU traits that are predicted by peer-relationship quality and, vice versa, after removing the between-individuals associations. Peer relationships may be particularly susceptible to strong between-individuals associations with CU traits because of the adolescent's ability to choose one's friends, which is not the case for parents. Because individuals with high CU traits are likely to be rejected by prosocial peers (Dijkstra & Berger, 2018; Shin et al., 2019; Wagner et al., 2020; Waller et al., 2017), they may be forced to choose deviant friends who are less likely to be warm (Kerr et al., 2012; Kimonis et al., 2004;

Thornton et al., 2015). Therefore, further study of the bidirectional effects between CU traits and peer relationships is warranted, especially using methods that can parse apart between-individuals associations and directional changes over time within the individual.

Romantic Relationships and CU Traits

A third dimension of interpersonal functioning that may be considered in relation to CU traits is romantic relationships. Dyadic romantic relationships typically form for the first time during adolescence (Furman, 2002), and they quickly become an important source of support (Furman & Buhrmester, 1992). Therefore, it would be important to determine whether CU traits potentially influence this social domain as well. Unfortunately, most research in this area has focused on the broader construct of psychopathy, which includes CU traits but also dimensions that are more closely related to antisocial behavior, such as impulsivity and irresponsibility (Leistico et al., 2008). Several studies have found that psychopathic traits are related to problems in romantic relationships, including infidelity, intimate-partner violence, low relationship satisfaction, and divorce (Goodnight et al., 2017; Jones & Weiser, 2014; Savard et al., 2006, 2011; Weiss et al., 2018). The few studies to investigate the relations between CU traits specifically and the quality of romantic relationships suggest similar interpersonal difficulties. Specifically, CU traits have been associated with lower emotional quality and satisfaction in romantic relationships in samples of adolescents and young adults (Backman et al., 2018; Golmaryami et al., 2021). This lower romantic relationship quality may be the result of unhealthy relationship behaviors that have also been associated with CU traits, including infidelity and the perpetration of physical and sexual aggression toward a romantic partner (Caiozzo et al., 2016; Crass & Terranova, 2018; Mager et al., 2014; Muñoz et al., 2011; Swogger et al., 2007).

Another limitation in research on CU traits and romantic relationships is that, similar to research on peer relationships, it has rarely investigated the directionality of effects. However, as theorized for peer relationships, bidirectional associations with CU traits may also be present in the romantic domain. Low-quality romantic relationships may limit opportunities to engage in prosocial behaviors, and limited prosocial behavior may reduce the affective quality of the relationship because of the lack of a mutually positive interaction (Amato, 1990; MacDonald, 1992). In addition, given that romantic partners become a primary attachment figure during adulthood (Kansky, 2018), romantic relationships may interact with empathy development in the same way that parenting relationships do earlier in life; warm romantic relationships

may encourage positive expectations of others and understanding of their emotions through a secure attachment and may similarly deteriorate if not reciprocated (Gross et al., 2017; Shaw & Bell, 1993; Stern & Cassidy, 2018). In one of the only studies to consider this possibility, Savard et al. (2006) analyzed the bidirectional connections between psychopathy and romantic-relationship satisfaction and cohesion in a sample of married couples over a 1-year period. They found that the emotional-interpersonal dimension of psychopathy, which is closely related to CU traits (but also includes narcissism, grandiosity, and manipulation), was predicted by low relationship satisfaction but not vice versa (Savard et al., 2006). However, because romantic relationships, like peer relationships, are prone to selection effects, the directional influences between romantic-relationship quality and CU traits must be considered after separating between-individuals and within-individuals effects.

Present Study

To summarize, there is substantial research to suggest that CU traits are linked to poor interpersonal functioning. However, there are several limitations to existing research that should be addressed to fully understand the interpersonal relationships of individuals with CU traits. The primary research gap is a lack of investigation into directionality of effects. Although research on parenting has found promising evidence that CU traits both lead to and are influenced by low parental warmth, bidirectional effects have not been systematically investigated in peer and romantic relationships. In addition, the evidence for bidirectional effects between CU traits and parental warmth has been reported mainly in studies of young children. It is important to study these relationships over adolescence and into young adulthood to determine whether the directionality of effects changes over time. It is also particularly important to study peer and romantic relationships during adolescence and young adulthood given the influential nature of these relationships during these developmental stages. Finally, it is essential to parse out the overall between-individuals associations between CU traits and relationship quality to properly determine whether these variables predict changes in one another within individuals over time.

To address these limitations, in the current study, we investigated the bidirectional associations between CU traits and relationship quality in parent, peer, and romantic relationships in adolescence and young adulthood. We used a diverse and high-risk (i.e., justice-involved) sample of male adolescents to capture a greater variability in CU traits. CU traits and relationship

qualities were measured across six time points across adolescence into young adulthood, allowing us to provide a strong control for between-individuals differences when studying within-individuals changes. We hypothesized that after between-individuals trait-like associations between CU traits and relationship quality were removed, negative bidirectional associations would be present between CU traits and warmth in all relationships such that high CU traits would predict reductions in relationship warmth over time and high relationship warmth would predict reductions in CU traits. These bidirectional associations were also predicted to be largely consistent over the course of adolescence and young adulthood.

Method

Participants

We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. This study used participants from the Crossroads Study, a multisite, longitudinal, national study that recruited from the justice systems of Orange County, California; Philadelphia, Pennsylvania; and Jefferson Parish, Louisiana. The goal of the Crossroads Study was to investigate whether adolescents arrested for charges of similar severity would differ in their outcome depending on whether they were diverted from the juvenile justice system (Cauffman et al., 2021). Only boys were included because of the limited number of girls arrested in the three jurisdictions and the difficulty in equating the severity of charges across sex. Eligible participants were English-speaking male adolescents arrested for the first time for an offense of mild to moderate severity (i.e., vandalism, theft, possession of marijuana for personal use). Approximately 72% of eligible participants enrolled in the study, leading to a final sample of 1,216 males who were between 13 and 17 years of age at recruitment (M = 15.29 years). The sample was predominantly Latino (46%) and Black (37%), and the remainder of the sample identified as White (15%) or other (2%). In addition, 27% of the sample did not have a parent who finished high school.

Procedure

Institutional review board approval was obtained by the institutions at each site. After a juvenile's first arrest, the research team recruited participants who met the inclusionary criteria and received informed consent from a parent or guardian and assent from the participant. Participants and parents were informed that participation was voluntary and would have no effect on

their involvement with the justice system. A Privacy Certificate was obtained from the Department of Justice to protect the participants' sensitive data from subpoenas, court orders, and other types of involuntary disclosures, and the nature of the Privacy Certificate was described before each interview. Eligible participants then participated in a standardized, structured interview led by an experienced interviewer within 6 weeks of their arrest. Interviews took place in the participant's home or another public location convenient for the youth (coffee shop, fast food restaurant, etc.). Interviews could also be conducted in a secure facility if the youth was incarcerated. Interview laptops were equipped with all study questions, and questions were read aloud to the participant to control for reading ability. Following the baseline interview, follow-up interviews were completed every 6 months for the first 3 years and then annually until Year 5. If the participant moved outside of the study area, follow-up interviews could be completed by phone. For the present study, only annual follow-up interviews over the 5 years following the initial arrest were used to maintain consistent intervals between time points. After reaching the age of 18, participants provided consent for themselves. Participants were compensated with $50 at the baseline interview, $80 at Year 1, $110 at Year 2, and $140 at Years 3, 4, and 5. Across the six survey waves, participation rates were high (from 94% at Year 1 to 84% at Year 5).

Measures

Main study variables.

CU traits. The Inventory of Callous-Unemotional Traits (ICU; Kimonis et al., 2008), a 24-item self-report measure, assessed CU traits at each time point. Each item is rated on a scale from 0 (*not at all true*) to 3 (*definitely true*). The measure consists of an equal number of positively worded (reflecting a high level of CU traits; e.g., "The feelings of others are unimportant to me") and negatively worded (reflecting a low level of CU traits; e.g., "I try not to hurt others' feelings") items. Items are summed (with negatively worded items reverse-scored) to create a total score in which a higher score reflects a higher level of CU traits. Although the ICU items have been found to factor into three subdomains, the items consistently load on an overarching factor that is captured well by unit weighing of items, the subscales are largely the results of method variance (i.e., positively vs. negatively worded items), their variance is largely due to the overarching factor, and they do not show consistent and theoretically meaningful differential associations with important external criteria (Ray et al., 2016; Ray & Frick, 2020). Furthermore, the ICU total score has shown consistent positive

associations with antisocial behavior and negative associations with empathy in a variety of child and adolescent samples (Cardinale & Marsh, 2020). Although thorough testing of the factor structure of the ICU lies outside the scope of the current article (Kliem et al., 2020; Koutsogiorgi et al., 2021), longitudinal measurement invariance (Putnick & Bornstein, 2016) of the ICU (with all 24 items loading onto an overarching factor) was tested in the current sample to determine the interpretability of mean differences across time. Strict measurement invariance was established across all six time points (see Table S1 in the Supplemental Material available online; Chen, 2007; Putnick & Bornstein, 2016; Rutkowski & Svetina, 2014). Furthermore, internal consistencies (Cronbach's αs) for the ICU ranged from .76 to .80 across time points.

Relationship warmth. The nine-item warmth scale drawn from the Quality of Parental Relationships Inventory (Conger et al., 1994) measured emotional warmth in parent, peer, and romantic relationships at all time points. The participant indicated the frequency of warm behaviors displayed by each relationship partner, including "have a good laugh with you about something that was funny" and "listen carefully to your point of view," in the time since the previous interview on a scale from 1 (*always*) to 4 (*never*). For all scale items, see Table S2 in the Supplemental Material. For the parent questionnaires, participants were asked to identify and answer questions about their primary female caregiver for the maternal questionnaire and primary male caregiver for the paternal questionnaire. At baseline, 89% of participants identified their biological mother as their primary female caregiver, and 60% identified their biological father as their primary male caregiver. Some other identified caregivers at baseline included a stepmother (1%) or stepfather (15%), grandmother (4%) or grandfather (1%), and aunt (1%) or uncle (1%). For the friend questionnaire, participants were asked to think generally about their friends. Finally, if participants indicated that they were currently in a romantic relationship, they completed the romantic-partner questionnaire regarding their current partner. For all relationship-warmth questionnaires, relevant questions would be skipped if the participant endorsed not having the relationship of interest or not having contact (in person or by phone) with the relationship partner in the time since the previous interview. No items on the warmth questionnaire were dependent on physical proximity or in-person contact, so individuals with phone-only contact with relationship partners still answered warmth questions to reduce bias against participants with extenuating circumstances (i.e., incarceration, moving away from their home of origin). Note that only 28% of the Crossroads sample was incarcerated at any point in time during the 5-year follow-up period, and

77% of these incarcerations took place during the first 2 years following the arrest (Cauffman et al., 2021).

This measure was previously adapted to capture parental warmth and hostility from the youth's perspective in a sample of justice-involved adolescents (Williams & Steinberg, 2011). For the Crossroads Study, this questionnaire was again adapted to ask questions related to friendships and romantic relationships as well. Thus, the same items were asked regarding parents, friends, and romantic partners, with the exception of "tell you they love you," which for friends was qualified with "not in a romantic way." This methodology was important for the purpose of the current study because it allowed us to assess emotional quality across the different relationships in a similar manner. The nine-item parental-warmth scale has previously shown consistent negative associations with parental hostility and delinquency in a sample of justice-involved adolescents (Williams & Steinberg, 2011). Longitudinal-measurement invariance was tested separately for each of the four relationship scales, and the nine items for each scale loaded onto a single factor (see Table S1 in the Supplemental Material). Maternal-, paternal-, and peer-warmth scales showed strict measurement invariance, whereas the romantic-warmth scale showed scalar invariance. Thus, the interpretation of mean differences across all main study variables was deemed to be appropriate (Putnick & Bornstein, 2016). All relationship-warmth scales also showed good to excellent internal consistencies across time points (Cronbach's αs = .85–.95).

Data analysis

Data analyses were conducted in Mplus 8.4. There was significant missing data on relationship-warmth measures because these items were administered only if participants indicated having each relationship (i.e., having contact with their maternal or paternal figure, having at least one friend, or having a romantic partner). Therefore, to avoid making inferences regarding relationship warmth on the basis of individuals who do not consistently have these relationships, participants were included in each relationship model only if they indicated having the respective relationship at three or more (out of six) time points. After making these exclusions, sample sizes for maternal, paternal, peer, and romantic models were 1,141, 802, 1,122, and 329, respectively. To determine whether the individuals included in analyses differed from excluded individuals, we conducted preliminary analyses testing whether these subsets of the sample with more engagement with social relationships differed from the full sample on CU traits or age. After eliminating participants without the relationship of interest at more than half of the time

points, all other missing data were estimated using the maximum likelihood robust (MLR) estimator.

To test the hypothesis that negative bidirectional relationships would be present between CU traits and relationship warmth, a series of random intercept cross-lagged panel models (RI-CLPMs; Hamaker et al., 2015) were used. The RI-CLPM improves on traditional cross-lagged panel models by estimating trait-like between-individuals differences using random intercepts. When between-individuals differences are removed, cross-lagged paths, autoregressive paths, and within-times correlations are estimated using within-individuals latent variables. This method of disaggregating between- and within-individuals effects most effectively allows for investigation of directional hypotheses by enabling cross-lagged paths to predict deviations from one's overall level of a trait (Usami et al., 2019). The presence of negative, significant cross-lagged paths in both directions (i.e., both relationship warmth predicting future CU traits and CU traits predicting future relationship warmth) in each relationship model would support study hypotheses regarding bidirectional effects.

For each relationship model (i.e., maternal, paternal, peer, and romantic), three models were compared. Model 1 constrained autoregressive and cross-lagged paths to be equal across time. Constrained autoregressive paths were estimated separately for relationship warmth and CU traits, and constrained cross-lagged paths were estimated separately for warmth predicting future CU traits and CU traits predicting future warmth. Model 2 constrained autoregressive paths to be equal across time, but cross-lagged paths were estimated freely for each wave. Model 3 allowed all paths to be estimated freely. Significant improvements in model fit were tested using χ^2 difference tests, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), Akaike information criterion (AIC), and Bayesian information criterion (BIC; Hu & Bentler, 1999). Because the MLR estimator was used for model estimation, χ^2 difference tests were scaled using formulas provided by Muthén and Muthén (2005). Significant χ^2 difference tests indicate that reducing constraints across time resulted in significant improvement in model fit. According to Chen's (2007) recommendations for significant differences in model-fit indices, reductions of more than .015 for RMSEA, increases of more than .01 for CFI, and reductions of more than .03 for SRMR indicate significant improvement in model fit. Reductions in AIC and BIC indicate improvement in model fit. It was hypothesized that Model 1 would be the best-fitting model for each relationship type, which would indicate that the pattern of directional effects was consistent across adolescence and into young adulthood.

Post hoc power analyses were also conducted for each relationship RI-CLPM using Monte Carlo simulations (Muthén & Muthén, 2002). Using the present sample size and pattern of missing data for each model, in these analyses, we estimated the ability to detect small to moderate effect sizes of .25 for all between- and within-individuals effects. This was deemed to provide adequate power according to estimates of the association between relationship quality and CU traits from past research (Backman et al., 2018; Boele et al., 2019; Golmaryami et al., 2021; Goulter et al., 2020; Haas et al., 2018; Muratori et al., 2016; Waller et al., 2018).

Our method of comparing constrained and unconstrained models allowed us to determine whether predictive associations were consistent over the waves of data collection. However, because participants varied in age at each time point, sensitivity analyses were conducted controlling for the impact of age. For these analyses, the time-invariant covariate of baseline age was added to each best-fitting model (Mulder & Hamaker, 2021) such that within- and between-individuals associations between CU traits and relationship warmth could be tested independently of their associations with age. It was predicted that the pattern of results would not differ when controlling for age, in support of hypotheses that results would largely be consistent across adolescence and young adulthood.

Results

Preliminary analyses indicated that samples used in maternal, paternal, peer, and romantic relationships did not differ significantly from the full sample on CU traits. Maternal, paternal, and peer samples also did not differ from the full sample on age, but the sample used in romantic analyses had a slightly higher age ($M = 15.46$ years) than the full sample ($M = 15.22$ years), $t(1214) = -2.90$, $p = .004$, $\eta^2 = .01$. Descriptive statistics (see Table S3 in the Supplemental Material) and zero-order correlations (see Table S4 in the Supplemental Material) for all study variables and the code for RI-CLPM and power analyses are provided in the Supplemental Material. Table 1 provides the model fit information for RI-CLPMs for all relationships.

CU traits and parental warmth

Model results were largely consistent for both maternal and paternal warmth. Power analyses for both maternal and paternal warmth indicated that the current sample was adequately powered to detect small to medium effect sizes for all parameters; all power estimations exceeded .99 for maternal and paternal models. In support of hypotheses, Model 1 (with cross-lagged and

Table 1. Multiple-Panel Cross-Lagged Panel Model Fit Statistics

Model	Autoregressive paths	Cross-lagged paths	RMSEA	CFI	TLI	SRMR	AIC	BIC	$\Delta\chi^2$ (Δdf) Model 1	$\Delta\chi^2$ (Δdf) Model 2
Maternal warmth										
Model 1	**Constrained**	**Constrained**	**.035**	**.984**	**.980**	**.059**	**80,474**	**80,660**	—	—
Model 2	Constrained	Free	.037	.985	.978	.057	80,476	80,703	12.51 (8)	—
Model 3	Free	Free	.042	.984	.972	.054	80,480	80,747	21.01 (16)	8.80 (8)
Paternal warmth										
Model 1	**Constrained**	**Constrained**	**.040**	**.981**	**.976**	**.059**	**56,017**	**56,190**	—	—
Model 2	Constrained	Free	.043	.981	.973	.060	56,021	56,232	9.94 (8)	—
Model 3	Free	Free	.047	.981	.967	.055	56,025	56,273	19.56 (16)	9.64 (8)
Peer warmth										
Model 1	**Constrained**	**Constrained**	**.041**	**.976**	**.970**	**.062**	**77,759**	**77,945**	—	—
Model 2	Constrained	Free	.045	.976	.965	.061	77,766	77,992	8.38 (8)	—
Model 3	Free	Free	.048	.977	.960	.052	77,765	78,031	22.67 (16)	14.24 (8)
Romantic warmth										
Model 1	Constrained	Constrained	.042	.968	.961	.124	19,692	19,833	—	—
Model 2	**Constrained**	**Free**	**.039**	**.977**	**.966**	**.112**	**19,692**	**19,863**	16.23* (8)	—
Model 3	Free	Free	.045	.975	.955	.086	19,697	19,898	22.54 (16)	7.66 (8)

Note: RMSEA = root mean square error of approximation, acceptable values < .08; CFI = comparative fit index, acceptable values > .90; TLI = Tucker-Lewis index, acceptable values > .90; SRMR = standardized root mean square residual, acceptable values < .10; AIC = Akaike information criterion; BIC = Bayesian information criterion. Change in χ^2 and degrees of freedom reflect comparisons with either Model 1 or Model 2 using scaling adjustments for the maximum likelihood robust estimator. The best-fitting model that was retained for interpretation is depicted in bold.
*p < .05.

autoregressive paths constrained over time) was the best-fitting model for maternal and paternal warmth models. As shown in Table 1, allowing these paths to be estimated freely for each wave did not significantly improve model fit according to χ^2 difference tests and model-fit indices. Furthermore, Model 1 displayed acceptable model fit for both relationships according to standard cutoffs for RMSEA, CFI, TLI, and SRMR (Hu & Bentler, 1999).

Constrained RI-CLPM results for parental warmth are displayed in Table 2. For both maternal and paternal warmth, CU traits and parental warmth were significantly negatively related at the between-individuals level (βs = −0.36 and −0.38) such that individuals with higher overall levels of CU traits tended to have lower overall levels of maternal and paternal warmth. At the within-individuals level, parental warmth and CU traits were stable over time (βs = 0.24–0.26) and negatively correlated within time points (βs ranging from −0.12 to −0.30). However, only one direction of cross-lagged paths was significant. For both maternal and paternal warmth, CU traits significantly negatively predicted future warmth (βs = −0.05 and −0.10, respectively), but parental warmth did not significantly predict future CU traits (βs = −0.04 and −0.03, respectively). Furthermore, this unidirectional pattern of results did not differ when controlling for age as a time-invariant covariate.

CU traits and peer-relationship warmth

The peer-warmth RI-CLPM was also adequately powered to detect small to medium effect sizes for all paths (power > .99). Model 1 with constrained parameters best fit the data and displayed acceptable fit (Table 1). As shown in Table 2, peer warmth and CU traits were significantly negatively correlated at the between- and within-persons levels; both random intercept (β = −0.43) and within-times latent variables (βs ranging from −0.12 to −0.21) were negatively correlated. Peer warmth and CU traits were also stable over time (βs = 0.26). However, the directional hypotheses were not supported in this model because neither the constrained cross-lagged path of CU traits predicting peer warmth (β = −0.03) nor the cross-lagged path of peer warmth predicting CU traits (β = −0.02) was significant. After controlling for age, both directions of effects remained statistically insignificant.

CU traits and romantic-relationship warmth

Power analyses for romantic warmth indicated that several parameters were not adequately powered to detect effect sizes of .25. This finding is not surprising given the smaller sample sizes for these analyses. Specifically,

Table 2. Parameter Estimates for Random Intercept Cross-Lagged Panel Models for Parental and Peer Warmth

Parameter	Maternal			Paternal			Peer		
	B [95% CI]	*SE*	β	*B* [95% CI]	*SE*	β	*B* [95% CI]	*SE*	β
Between-individuals association									
CU traits ↔ warmth	−8.68*** [−10.88, −6.48]	1.12	−0.36	−12.14*** [−15.37, −8.91]	1.65	−0.38	−9.03*** [−11.04, −7.01]	1.03	−0.43
Constrained cross-lagged paths									
CU traits → warmth	−0.03* [−0.07, −0.00]	0.02	−0.05	−0.08** [−0.13, −0.03]	0.02	−0.10	−0.03 [−0.06, 0.01]	0.02	−0.03
Warmth → CU traits	−0.05 [−0.11, 0.01]	0.03	−0.04	−0.04 [−0.10, 0.02]	0.03	−0.03	−0.02 [−0.08, 0.04]	0.03	−0.02
Constrained autoregressive paths									
CU traits	0.25*** [0.20, 0.30]	0.03	0.25	0.26*** [0.20, 0.32]	0.03	0.26	0.26*** [0.21, 0.31]	0.03	0.26
Warmth	0.25*** [0.19, 0.32]	0.03	0.26	0.23*** [0.17, 0.30]	0.03	0.24	0.26*** [0.20, 0.32]	0.03	0.26
Within-times correlations									
Baseline	−8.75*** [−11.48, −6.01]	1.40	−0.30	−9.41*** [−12.81, −6.00]	1.74	−0.27	−4.65*** [−7.01, −2.29]	1.21	−0.16
Year 1	−6.10*** [−8.15, −4.05]	1.05	−0.22	−8.91*** [−11.74, −6.07]	1.45	−0.29	−5.02*** [−7.16, −2.89]	1.09	−0.19
Year 2	−4.70*** [−6.58, −2.83]	0.96	−0.20	−4.26** [−7.05, −1.46]	1.43	−0.15	−3.63*** [−5.65, −1.60]	1.03	−0.15
Year 3	−5.07*** [−7.00, −3.15]	0.98	−0.22	−3.67** [−6.29, −1.05]	1.34	−0.15	−5.21*** [−7.28, −3.14]	1.06	−0.21
Year 4	−3.13** [−5.21, −1.06]	1.06	−0.12	−4.27** [−7.21, −1.32]	1.50	−0.15	−3.19** [−5.32, −1.07]	1.08	−0.12
Year 5	−4.52*** [−6.56, −2.47]	1.04	−0.18	−4.16** [−6.90, −1.43]	1.40	−0.15	−3.36** [−5.64, −1.07]	1.17	−0.13

Note: Because standard deviations differed across time points, constrained standardized estimates were not equal across time. The average standardized estimate across time points is reported as β. CI = confidence interval; CU = callous-unemotional.
*$p < .05$. **$p < .01$. ***$p < .001$.

the cross-lagged paths between romantic warmth and CU traits in the first two waves had power estimations of .71 to .78. However, the between-individuals association between romantic warmth and CU traits and the cross-lagged paths for the final three waves (Years 2–5) had power greater than .80 (.82–.94) to detect effects of .25. Therefore, although the romantic-warmth RI-CLPM estimation included all time points, only the adequately powered paths are interpreted here.

Unlike parental and peer warmth, Model 2 with constrained autoregressive paths and freely estimated cross-lagged paths best fit the data according to χ^2 difference tests (Table 1). Model 2 also resulted in the lowest RMSEA and highest CFI and TLI of the three models, although these differences were largely not significant (Δs < .01). Compared with Model 1, Model 2's AIC was marginally smaller (ΔAIC < 1), but the BIC was higher. Finally, although Model 3 resulted in a lower SRMR than Model 2, this difference was not

significant (ΔSRMR < .03). Thus, although model-fit indices were somewhat inconsistent for romantic warmth, the majority of indices supported Model 2 as the best-fitting model. Autoregressive paths therefore were constrained to be equal across time, but cross-lagged paths were estimated freely.

Full results of the romantic-warmth RI-CLPM are depicted in Table 3, and Figure 1 displays the final three waves of this model. Romantic warmth and CU traits were significantly negatively related at the between-individuals level (β = −0.26) but inconsistently related at the within-individuals level within time points (βs ranging from −0.03 to −0.24). Although the stability of romantic warmth could not be accurately estimated because of low power, CU traits were stable over time (β = 0.22) in this model. Finally, in contrast to parental and peer-warmth models, there was support for bidirectional effects in the final two waves of the model. Romantic warmth at Year 3 (age: *M* = 18.97 years)

Table 3. Parameter Estimates for Romantic Warmth Random Intercept Cross-Lagged Panel Model

Parameter	B [95% CI]	SE	β	B [95% CI]	SE	β
Between-individuals association						
CU traits ↔ warmth	−4.01** [−7.02, −1.00]	1.54	−0.26			
Cross-lagged paths	*CU traits → Warmth*			*Warmth → CU traits*		
Baseline → Year 1	*0.02 [−0.07, 0.11]*	*0.04*	*0.04*	*−0.06 [−0.32, 0.21]*	*0.14*	*−0.03*
Year 1 → Year 2	*−0.02 [−0.14, 0.10]*	*0.06*	*−0.04*	*0.30 [−0.11, 0.70]*	*0.20*	*0.16*
Year 2 → Year 3	*−0.03 [−0.13, 0.08]*	0.05	*−0.04*	0.11 [−0.38, 0.61]	0.25	0.06
Year 3 → Year 4	*−0.01 [−0.17, 0.15]*	0.08	*−0.02*	−0.39** [−0.68, −0.11]	0.15	−0.25
Year 4 → Year 5	−0.13* [−0.24, −0.02]	0.06	−0.25	−0.24 [−0.54, 0.06]	0.15	−0.15
Constrained autoregressive paths						
CU traits	0.21*** [0.13, 0.29]	0.04	0.22			
Warmth	*0.14 [−0.01, 0.29]*	*0.08*	*0.15*			
Within-times correlations						
Baseline	*−4.24 [−11.96, 1.63]*	*3.00*	*−0.17*			
Year 1	−3.05* [−5.95, −0.16]	1.48	−0.16			
Year 2	−0.54 [−5.29, 4.22]	2.43	−0.03			
Year 3	−4.94* [−9.76, −0.12]	2.46	−0.24			
Year 4	−2.70 [−6.38, 0.97]	1.88	−0.14			
Year 5	−3.55* [−6.45, −0.64]	1.48	−0.22			

Note: Parameter estimates depicted in italics are not adequately powered (power < .80) to detect effect sizes of .25 and are not included in interpretation because of low precision of estimates. CI = confidence interval; CU = callous-unemotional.
*p < .05. **p < .01. ***p < .001.

negatively predicted CU traits at Year 4 (age: M = 19.98 years; β = −0.25), and CU traits at Year 4 (age: M = 19.98 years) negatively predicted romantic warmth at Year 5 (age: M = 20.98 years; β = −0.25). This pattern of results also did not differ when using age as a covariate.

Discussion

Results of the current study suggest that during adolescence and early adulthood, the magnitude and direction of longitudinal effects between CU traits and relationship warmth differs depending on the type of relationship. Although CU traits consistently predicted reductions in parental warmth over time, no directional associations were found between CU traits and peer warmth. Support for bidirectional effects was found between CU traits and romantic relationships, but this was found only when participants reached young adulthood.

There was strong support for CU traits predicting changes in both maternal and paternal warmth over time. These effects were also consistent over adolescence and into young adulthood such that constraining the effects to be equal across time best fit the data and controlling for age did not affect results. Although effect sizes were relatively small (βs = −0.05 and −0.10 for maternal and paternal warmth, respectively), we note that these paths are estimated after removing the

association between CU traits and relationship warmth at the between-individuals level, which were also significantly negatively associated (βs = −0.36 and −0.38 for maternal and paternal warmth, respectively).

Thus, current results support that individuals with elevated CU traits tend to have less warm relationships with their parents and CU traits are predictive of a deterioration of the parenting relationship over time during adolescence and young adulthood. Emotional warmth in a parenting relationship relies on a degree of reciprocity from the child (MacDonald, 1992), and individuals with elevated CU traits may be unable to provide warmth and affection to a parent because of their limited affective expression. This relationship may not be rewarding to the parent as a result, and they may become less warm toward their child over time. Thus, the negative interpersonal style of adolescents and young adults with CU traits seems to lead to a less emotionally close dyadic relationship with parents over time. This finding is clinically important given that poor-quality relationships with parents can have significant negative psychological outcomes for adolescents, including lower life satisfaction and greater depressive symptoms (Schwarz et al., 2012; Vaughan et al., 2010). Therefore, these findings implicate CU traits as a predictor of poor-quality relationships with parents and add to other problematic outcomes associated with CU traits, supporting their inclusion in recent
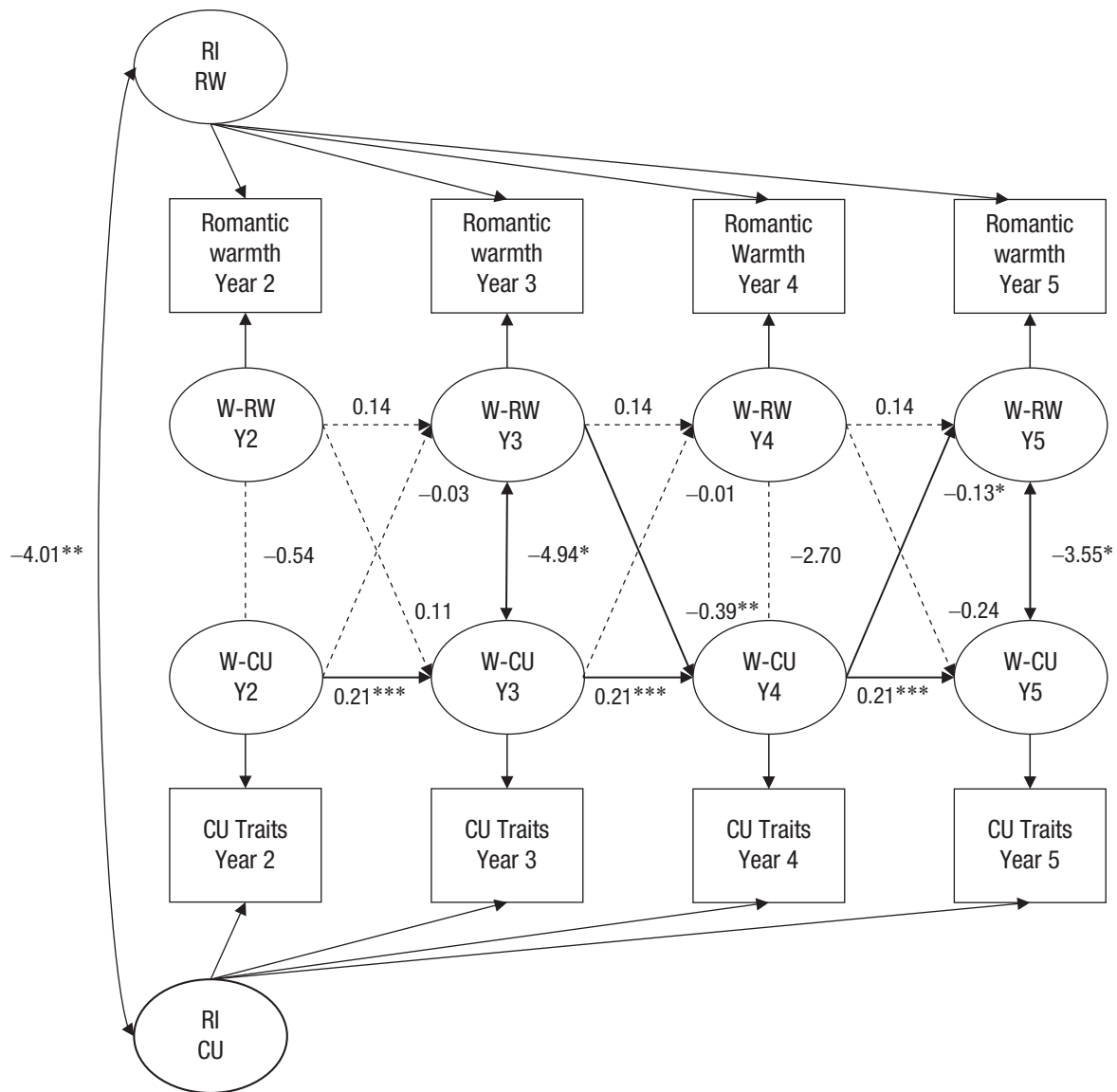
Fig. 1. Romantic-warmth random intercept cross-lagged panel model results. RI = random intercepts (between-individuals latent variables); W = within-individuals latent variables; RW = romantic warmth; CU = callous-unemotional. Dashed lines indicate paths with inadequate power (< .80) to detect effect sizes of .25. Baseline and Year 1 time points were included in model estimation, but Baseline to Year 1 and Year 1 to Year 2 panels are not depicted in figure because of inadequate power (< .80) to detect cross-lagged effect sizes of .25. *p < .05, **p < .01, ***p < .001.

diagnostic systems for conduct disorders (APA, 2013; WHO, 2019).

There was no evidence to suggest, however, that parental warmth predicted reductions in CU traits over time, which did not support study hypotheses. These findings suggest that parental warmth may not be an important protective influence for the development and maintenance of CU traits during adolescence and young adulthood. Several previous longitudinal studies have found evidence for this direction of effects (Hawes et al., 2011; Muratori et al., 2016; Waller et al., 2014), but these studies have focused on younger samples

(ranging from infancy to late childhood) in which the parenting relationship may have more influence on pro-social development (Kochanska, 1997; Stern & Cassidy, 2018). In addition, no study to date has used an analytic method that separates between- and within-individuals associations when investigating bidirectional effects between parenting and CU traits. Thus, previous findings with younger samples should be replicated using this methodology to better understand the protective influence of parental warmth for the development and maintenance of CU traits throughout the life span (Berry & Willoughby, 2017).

Contrary to study hypotheses, no directional associations were found between CU traits and friendship warmth. Despite a significant negative association between peer warmth and CU traits at the between-individuals level, which had the largest effect size (β = −0.43) of any relationship in this study, no within-individuals cross-lagged associations were significant in this model. These findings would indicate that although adolescents and young adults with elevated CU traits are more likely to have less warm friendships, CU traits do not predict changes in the emotional warmth of a friendship, and having friendships with high emotional warmth does not appear to predict changes in CU traits within individuals. We hypothesize that these results may be explained by a combination of peer rejection and selection effects that may have taken place earlier in development. For example, individuals with CU traits are likely to be rejected by peers from a young age (Dijkstra & Berger, 2018; Shin et al., 2019; Wagner et al., 2020; Waller et al., 2017), and individuals high on CU traits are likely to choose friends with similar levels of aggression and low prosocial emotions and behavior (Fortuin et al., 2015; Shin et al., 2019). Therefore, by the time individuals with elevated CU traits reach adolescence, they may have already been rejected by prosocial peers and formed friendships with other children with elevated CU traits whose limited emotional expression could lead to a friendship with low overall warmth. However, this lower level of warmth is a result of trait-like characteristics within the individuals and is not affected over time by the variations in CU traits within individuals. Furthermore, the finding that warm friendships did not predict changes in CU traits could suggest that the friendship relationship may not be intimate enough to affect prosocial development, particularly given that friendships in adolescent boys tend to be less emotionally close and intimate than those in girls (Johnson, 2004). Previous findings have also indicated that individuals high in CU traits are less affected by the delinquent behavior of their peers than individuals low in CU traits (Kerr et al., 2012), suggesting that the peer context may be a less important influence on the prosocial and antisocial development of these youths.

Finally, the only relationship in our study in which there was support for bidirectional effects between relationship warmth and CU traits was romantic relationships. Elevated CU traits predicted reductions in romantic-relationship warmth between Years 4 and 5, which is consistent with research suggesting that CU traits are related to perpetration of unhealthy behaviors in romantic relationships that could negatively affect relationship warmth, such as physical aggression, dominance, and infidelity (Caiozzo et al., 2016; Crass & Terranova, 2018; Golmaryami et al., 2021). The

interpersonal and emotional deficits of individuals with CU traits may also cause a relationship partner to reduce their efforts to build warmth in the relationship because of the lack of reciprocity in shared emotional experience and bonding necessary for a close attachment (Gross et al., 2017; Shaw & Bell, 1993). Note that warm romantic relationships at Year 3 also predicted reductions in CU traits at Year 4. Such findings support the possibility that warm romantic relationships encourage prosocial development by providing motivation and opportunities to improve prosocial emotions and behaviors in adolescents and young adults (Amato, 1990; MacDonald, 1992). Relationships that are high in warmth also foster emotional closeness and secure attachment styles, which encourage taking the perspective of other people and caring about their feelings, resulting in greater prosocial expression and lower CU traits (Padilla-Walker et al., 2015; Stern & Cassidy, 2018). These bidirectional effects were present across only two panels (Year 3 to Year 4 and Year 4 to Year 5), by which point, most participants had reached young adulthood (average ages range from 18.97 years at Year 3 to 20.98 years at Year 5). Although participants varied in age at each time point, controlling for age did not change results. Therefore, these findings may indicate that warm romantic relationships begin to show bidirectional associations with CU traits only during young adulthood, but further research with adolescent and adult populations would be needed to support this possibility. The finding that these bidirectional effects were present in romantic relationships but not peer relationships suggests that intimate relationships, rather than casual friendships, may be the most important for encouraging the development of prosocial emotions and behaviors and reducing CU traits during adulthood and that romantic relationships may be replacing the parenting relationship as the closest and most emotionally intimate relationship in one's life at this stage in development (Kansky, 2018).

All of these study conclusions must be considered in light of several limitations. First, it would be important to replicate these findings using non-self-report measures of relationship warmth, such as parent- or peer-report measures or observational measures, to determine whether the findings replicate across different methods. In addition, our study used measures of relationship warmth that were designed to measure this construct similarly across relationships to be able to compare differences across relationships. However, it is possible that warmth may be expressed differently in parent, peer, and romantic relationships (Crick et al., 2009; Furman & Collins, 2009), further supporting the need to replicate results with different measures. Second, results should be replicated in female samples. We have noted that the intimacy of peer relationships may

differ for boys and girls. Furthermore, CU traits are more strongly related to relational aggression, or harming others through social relationships, than to physical aggression in girls (Marsee & Frick, 2007), meaning that CU traits could have a greater negative impact on social relationships in girls than in boys. Third, although warmth has emerged as a key parenting construct for the development of CU traits (Goulter et al., 2020; Waller et al., 2018), it is unclear whether warmth is the only feature of friendships and romantic relationships that predicts high-quality relationships. As a result, future research may consider how other dimensions (e.g., satisfaction, length) of friendships and romantic relationships influence and are influenced by CU traits. Likewise, although CU traits were the target of the current investigation because of their developmental and clinical importance as an identifier of a distinct trajectory of antisocial behavior (Frick et al., 2014), research on romantic relationships has found that other dimensions of psychopathy are also related to romantic development (Savard et al., 2006), warranting greater consideration of how distinct dimensions of psychopathy may interact with interpersonal relationships over time in future work. Finally, the relatively small number of participants in the current sample who endorsed romantic relationships limited the ability of the current analyses to adequately estimate the cross-lagged associations between CU traits and romantic-relationship warmth at earlier time points. Note that this endorsement of romantic relationships (26% at baseline) is comparable with those found in community samples of adolescents (Gómez-López et al., 2019). Thus, our rate of involvement in romantic relationships does not appear to be unique to our justice-involved sample. This assertion is further supported by past research suggesting that adolescents' antisocial behavior does not hinder their involvement in romantic relationships (Monahan et al., 2014) and by our analyses indicating that individuals with more frequent romantic relationships did not differ in their level of CU traits from individuals with less frequent romantic relationships. However, note that individuals with greater romantic involvement were slightly older than individuals without, which is to be expected given that romantic involvement increases with age during adolescence (Kansky, 2018). Thus, although current findings provide insight into the associations between CU traits and romantic functioning in young adults, these associations should also be investigated in larger samples of adolescents.

Despite these limitations, the longitudinal nature of the present findings offers significant support for the influence of CU traits on poor interpersonal functioning in intimate relationships, including with parents and romantic partners. Unlike several previous studies on the link between interpersonal functioning and prosocial development (Backman et al., 2018; Goulter et al., 2020; Waller et al., 2018), the current longitudinal study was able to show that CU traits predict later deterioration in relationship warmth, placing individuals at risk for poor socioemotional outcomes in addition to a pattern of severe and pervasive antisocial behavior. Thus, there is great need for interventions for individuals with CU traits. Promising interventions for individuals with elevated CU traits suggest that teaching skills to recognize other people's emotions and using reward strategies to encourage emotional recognition and prosocial behavior can help to reduce the level of CU traits in young children (Kimonis et al., 2019); future research should also investigate how such interventions might affect the quality and warmth of future interpersonal relationships later in development.

In addition, the present findings could help to guide treatments that aim to reduce CU traits in adolescents and young adults. These results support previous research suggesting that interventions involving an individual's social context can be effective in reducing CU traits and behavior problems (Hawes et al., 2014; Wilkinson et al., 2016). Although previous studies with young children have largely focused on improving the parenting relationship to reduce CU traits (Hawes et al., 2014; Kimonis et al., 2019), current findings emphasize consideration of an individual's developmental stage when formulating treatments for CU traits and choosing which social context in which to intervene. In the current adolescent and young-adult sample, the strongest evidence for bidirectional effects was found in romantic relationships, indicating that interventions that foster strong, healthy, romantic relationships may be a way to improve prosocial emotions and behaviors, particularly in young adulthood. Past research on the effectiveness of family-based interventions for adolescents with elevated CU traits has found mixed results (Manders et al., 2013; White et al., 2013); thus, future research may consider a greater focus on improving social skills in other social contexts as a way to improve treatment outcomes for adolescents and young adults with elevated CU traits.

Transparency

Methodology: E. P. Vaughan. Project administration: E. L. Robertson, J. V. Ray, L. C. Thornton, T. D. Wall Myers. Supervision: P. J. Frick. Writing-original draft: E. P. Vaughan, P. J. Frick. Writing-review & editing: E. Cauffman, E. L. Robertson, J. V. Ray, L. Steinberg, L. C. Thornton, T. D. Wall Myers.

ORCID iDs

Erin P. Vaughan https://orcid.org/0000-0002-3316-2941
Emily L. Robertson https://orcid.org/0000-0001-7643-8242
Laura C. Thornton https://orcid.org/0000-0001-5209-9098

Supplemental Material

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