



Longitudinal Relationships among Parenting, Prosocial Behaviors, and Emotional Problems: Examining Between- and Within-Person Associations in Adolescents

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Abstract

Although bidirectional associations between parenting and adolescents' social and emotional outcomes have been investigated, how parental warmth and harsh parenting as two different parenting dimensions, adolescents' prosocial behaviors, and emotional problems were longitudinally and bidirectionally related at between- and within-person levels remains unclear. With a three-wave longitudinal design, the present study examined these associations by employing the random-intercept cross-lagged panel model. Data from 606 Chinese adolescents ($M_{age} = 13.80$ years, $SD = 0.52$, at T1; 45.7% girls) were collected at six-month intervals over one year, and participants completed questionnaires assessing their perception of parenting, prosocial behaviors, and emotional problems online. The results indicated that parental warmth and harsh parenting were significantly associated with adolescents' prosocial behaviors and emotional problems at the between-person level. At the within-person level, adolescents' more prosocial behaviors at T1 predicted later within-person decreases in their emotional problems at T2, which in turn predicted subsequent increased prosocial behaviors and more parental warmth at T3. Additionally, a higher level of harsh parenting at T2 unidirectionally predicted more adolescents' emotional problems at T3. These findings highlighted the developmental cascade processes among adolescents' prosocial behaviors, emotional problems, and parenting and the importance of fostering adolescents' prosocial behaviors in reducing their emotional problems and then promoting subsequent psychosocial adjustment and parent-child bonding.

Keywords Adolescents · Prosocial behaviors · Emotional problems · Parenting dimensions

Introduction

Adolescence is a critical developmental period involving major changes in cognitive, socioemotional, and biological functions (Steinberg, 2014). Adequate psychosocial adjustment, including social and emotional adjustment, to adapt to these changes is challenging for adolescents themselves (Gniewosz et al., 2023). Prosocial behaviors, reflecting social or behavioral adaptive adjustment, and emotional problems, reflecting adolescents' poor emotional adjustment, are believed to be two aspects of psychosocial

adjustment during adolescence (Gniewosz et al., 2023). Prior research found longitudinal and reciprocal relationships between prosocial behaviors and emotional problems (Memmott-Elison & Toseeb, 2023). Parental warmth and harsh parenting reflecting positive and negative parenting dimensions separately, have been demonstrated to have potent impacts on adolescents' prosocial behaviors and emotional problems (Bauer et al., 2022; Buckley et al., 2024). Also, adolescents' prosocial behaviors and emotional problems would impact interactions with their caregivers and parents' behaviors toward them later (Padilla-Walker et al., 2012; Rothenberg et al., 2020). Therefore, as the developmental cascade model suggests (Masten & Cicchetti, 2010), there may be bidirectional and dynamic relations between parental warmth, harsh parenting, adolescents' prosocial behaviors, and emotional problems over time. However, no study to date has investigated this issue. The present study sought to examine the longitudinal bidirectional relationships among parental warmth, harsh

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parenting, adolescents' prosocial behaviors, and emotional problems, especially in the case of differentiating between- and within-person effects using the random-intercept cross-lagged panel model (RI-CLPM) in adolescents.

Prosocial Behaviors and Emotional Problems

As mentioned above, prosocial behaviors and emotional problems are two critical aspects of psychosocial adjustment (Gniewosz et al., 2023) and reflect individuals' core psychosocial competence (Memmott-Elison & Toseeb, 2023). Prosocial behaviors refer to behaviors and actions intended to benefit others, including helping, sharing, and comforting (Eisenberg et al., 2015), are one vital aspect of social adjustment. Adolescence is a critical period for internalizing prosocial values and developing prosocial behaviors (Eisenberg et al., 2015; Streit et al., 2021). Prosocial behaviors form a crucial part of positive and stable social experiences and relationships in adolescence and are of paramount importance to enhance adolescents' other broader adaptive outcomes (e.g., health and educational achievement) and mitigate maladaptation (e.g., depression and aggressive behaviors) (Flouri & Sarmadi, 2016; Padilla-Walker et al., 2020). Emotional problems, reflecting problems with emotional adjustment and negative emotional state, are considered overall and not disorder-specific and cover a wide range of experienced emotional symptoms including depression, anxiety, and somatization (Goodman, 2001; He et al., 2013; Nilsen et al., 2015). Studies have demonstrated that adolescents' emotional problems were related to other extensive maladjustment outcomes such as aggressive behaviors or bullying (Memmott-Elison & Toseeb, 2023; Riglin et al., 2014).

Researchers also highlighted the associations between adaptive features, such as prosocial behavior and empathy, and psychopathological development, such as externalizing problems and internalizing problems (Eisenberg et al., 2024; Memmott-Elison et al., 2020; Padilla-Walker et al., 2015). In terms of the relationships between prosocial behaviors and emotional problems, on the one hand, studies found that prosocial behaviors are a protective factor for developing emotional problems in adolescence via alleviating their difficulties associated with internal over-regulation (Asgarabad et al., 2023; Flouri & Sarmadi, 2016). On the other hand, adolescents with emotional symptoms are prone to withdraw from social interactions with others and perceive higher interpersonal rejection, which causes them to have fewer opportunities to practice social skills and perform reduced prosocial behaviors (Belmans et al., 2019; Memmott-Elison & Toseeb, 2023). A longitudinal study of UK children indicated significant within-person bidirectional fluctuations between prosocial behaviors and emotional problems from childhood to

adolescence (Memmott-Elison & Toseeb, 2023). Hence, the bidirectional relationships existing between prosocial behaviors and emotional problems are convincing.

Parental Warmth, Harsh Parenting, Prosocial Behaviors, and Emotional Problems

Parenting is conceptualized as a series of parents' attitudes and behaviors in interacting with their children, which is a crucial family psychosocial factor to influence the development and social adaptation in children and adolescents (Eisenberg et al., 2006; Pinquart, 2017). Parental warmth and harsh parenting are commonly deemed two key dimensions of parenting (Miller et al., 2009; Vaughan et al., 2021). Parental warmth emphasizes parental expressions of care, responsiveness, acceptance, closeness, and support directed at their child, including expressions of approval, affection, and building upon or reciprocating warmth displayed by their child; in contrast, low warmth indicates insensitive, unresponsive, neglecting, and rejecting parental behaviors (Rohner, 2004; Vaughan et al., 2021). Harsh parenting is defined as the administration of discipline by parents and the extent to which parents engage in hostile behaviors directed at their child, including criticism, yelling, physical punishment, and psychological aggression, characterized by hostility, intrusiveness, and over-control (Lansford et al., 2009; Wang, 2017).

Adolescents experienced and perceived a higher level of warmth were more likely to form secure attachment representations and have more positive emotions and strengthened awareness of their own and others' emotions, which is in relation to a greater decrease in emotional problems and increase in prosocial behaviors; while a lack of warmth by parents may impede adolescents' capacities to share and consider the feelings of others, which hinders interpersonal communications and further hampers their psychosocial outcomes (Lan, 2022; Lansford et al., 2014; Padilla-Walker et al., 2016). In turn, as the child-driven effect from a transactional perspective of development suggests (Bates et al., 2014; Bronfenbrenner & Morris, 2006), studies found that adolescents who can effectively manage and regulate their own socio-emotional processes, show fewer emotional dysregulation and emotional problems, and perform more behaviors benefiting others, would evoke a higher level of parental warmth and build closer relationships with their parents (Ding et al., 2020; Otterpohl & Wild, 2015; Padilla-Walker et al., 2012).

Harsh parenting displaying hostile parent-child interactions and negative emotional expressions that parents direct toward their child, makes adolescents have more stressful interpersonal experiences and undercuts their fundamental developmental needs like autonomy and self-determination

(Hidalgo et al., 2023; Streit et al., 2021). Under frequent harsh parenting practices, adolescents' ability to regulate their own emotions and engage in other-oriented behaviors optimally might be damaged and then undermine their mental health and prosocial behaviors (Hidalgo et al., 2023; Padilla-Walker et al., 2016). Further, the coercion model highlighted that children's emotional and social difficulties would lead to increases in harsh parenting (Patterson, 2002). Parents and adolescents become immersed in a coercive cycle whereby children with poor psychosocial adjustment including more emotional problems and less prosocial behaviors may respond increasingly negatively to their parents, which would elicit their parents to become overly critical and harsh, increasingly angry and punitive and use more hostile strategies further (Baetens et al., 2015; Manongdo & García, 2011).

The Developmental Cascade Perspective

The developmental cascade model underlined the cumulative consequences of transactional processes among the constructs occurring in developing systems over time that result in spreading effects across domains of function in one developing system, as well as across different systems (Masten & Cicchetti, 2010). Cascade effects include causal effects of different constructs that are often mutual or bidirectional (Masten & Cicchetti, 2010). Some empirical evidence of cascade effects between the family environment system and adolescents' own psychosocial adjustment, and between adolescents' emotional domains and behavioral domains has been well documented (Memmott-Elison & Toseeb, 2023; Yu, 2023). In this vein, parental warmth and harsh parenting as crucial elements in the family system may begin a cascade to alter functional systems in the child, showing hypothetically spill-over into adolescents' individual developmental features such as the tendency to engage in prosocial behaviors or to experience emotional problems. Similarly, adolescents' own psychosocial features have cascading upward consequences for parenting over time as well. Potential cascade processes between multidimensional individual developmental dimensions as time progresses are emphasized (Eisenberg et al., 2024; Memmott-Elison & Toseeb, 2023). As mentioned above, the developmental cascades between adaptive features such as prosocial behavior and psychopathological features such as emotional problems in children and adolescents were demonstrated (Memmott-Elison et al., 2020; Memmott-Elison & Toseeb, 2023). However, the potential cascade processes among parenting (i.e., parental warmth and harsh parenting), adolescents' prosocial behaviors, and emotional problems over time were not fully investigated, especially when distinguishing within-person processes from between-person differences.

Current Study

Considering the lack of research on the potential cascade associations among parental warmth, harsh parenting, and adolescents' psychosocial outcomes, the present study examined the longitudinal and bidirectional associations among parental warmth, harsh parenting, adolescents' prosocial behaviors, and emotional problems at between- and within-person levels using the RI-CLPM in adolescents. Building on existing research evidence, this study hypothesized that, at the between-person level, the mean level of parental warmth/harsh parenting was significantly related to mean levels of prosocial behaviors and emotional problems, the mean level of prosocial behaviors was related to the mean level of emotional problems (Hypothesis 1); at the within-person level, fluctuations in parental warmth/harsh parenting would predict subsequent fluctuations in prosocial behaviors and emotional problems, and in turn fluctuations in prosocial behaviors and emotional problems would predict parenting later; likewise, fluctuations in prosocial behaviors and emotional problems could predict each other over time (Hypothesis 2).

Methods

Participants

Participants were recruited from two junior middle schools in northwestern China. Data were collected over one year in three waves, six months apart. At Time 1 (T1), a total of 687 Chinese adolescents were recruited. Of those who participated at T1, 644 adolescents completed the same measures at Time 2 (T2), and finally 606 adolescents completed at Time 3 (T3). Therefore, the valid sample consisted of 606 adolescents who had completed all three surveys in the present study ($M_{age} = 13.80$ years, $SD = 0.52$, 277 girls, at T1). Among them, 247 adolescents were from an urban school, and the remainder from a rural school. Results of attrition analyses showed that significant differences between attrition and retention adolescents were not found in demographic covariates and study variables ($ps > 0.05$). At each assessment point, consents from adolescents, schools, and parents were obtained. Adolescents who agreed to participate filled out a series of questionnaires on an online questionnaire platform (www.wjx.cn) in the school computer classrooms, which took approximately 15 min. On this platform, the questionnaire could be submitted successfully only after all items were answered. Hence, there were no missing values for all variables. Upon each completion, they received a small gift for participation. Family wealth of participants was assessed by the number of cars, computers, televisions, books, and

other learning-related facilities in the home. Specifically, 53.6% of the families had one or more computers, 66.7% had one or more cars, 81.5% had one or more televisions, and 21.5% had more than 100 books. Furthermore, more than half of parents (59.9% of fathers and 56% of mothers) had attended middle school level of education, and a minority of parents had a bachelor's degree or higher (22.8% of fathers and 17.5% of mothers). Ethical approval for the present study was obtained from the local ethics committee.

Measures

Parental warmth

The warmth subscale of the Chinese version of the Parental Bonding Instrument (Parker et al. 1979; Liu et al., 2011) is a self-report questionnaire and comprises six items (e.g., My mother spoke to me with a warm and friendly voice) for maternal and paternal warmth separately. Items were rated on a 4-point Likert scale from 0 (very unlikely) to 3 (very likely). A mean score of the responses for all 12 items (including mothers' and fathers' warmth) was created to reflect parental warmth and utilized for subsequent analyses, with a higher score representing more parental warmth. Prior studies of Chinese adolescents have indicated adequate psychometric properties of the warmth subscale (Liu et al., 2011; Li et al., 2016). In the present study, Cronbach's α coefficients for this subscale were 0.91, 0.91, and 0.93 at T1, T2, and T3, respectively.

Harsh parenting

The Chinese version of the Harsh Parenting Scale (Simons et al., 1991; Wang, 2017) is a self-report questionnaire and comprises four items (e.g., when I did something wrong or made my mother angry, my mother lost their temper or even yelled at me) for maternal and paternal harsh parenting separately. Items were rated on a 5-point Likert scale from 1 (never like that) to 5 (always like that). A mean score of the responses for all eight items (including mothers' and fathers' harsh parenting) was created to reflect harsh parenting and utilized for subsequent analyses, with a higher score representing more harsh parenting. Prior studies of Chinese adolescents have indicated adequate psychometric properties of the Harsh Parenting Scale (Lin et al., 2023; Wang et al., 2018). In the present study, Cronbach's α coefficients for this scale were 0.90, 0.91, and 0.95 at T1, T2, and T3, respectively.

Emotional problems

The emotional problems subscale of the Chinese version of the Strengths and Difficulties Questionnaire (Goodman,

2001; Yao et al., 2009) was used to measure adolescents' emotional problems, which is a self-report questionnaire and comprises five items involving frequency in which adolescents experienced symptoms of depression, anxiety, and somatic complaints (e.g., I often unhappy, depressed or tearful). Items were rated on a 3-point Likert scale from 0 (not true) to 2 (certainly true). A mean score of the responses for all five items was created and utilized for subsequent analyses, with a higher score representing more adolescents' emotional problems. Prior studies of Chinese adolescents have indicated the adequate psychometric properties of the emotional problems subscale (Liu et al., 2020; Yao et al., 2009). In the present study, Cronbach's α coefficients for this subscale were 0.79, 0.80, and 0.81 at T1, T2, and T3, respectively.

Prosocial behaviors

The prosocial behaviors subscale of the Chinese version of the Strengths and Difficulties Questionnaire (Goodman, 2001; Yao et al., 2009) was used to measure adolescents' prosocial behaviors, which is a self-report questionnaire and comprises five items (e.g., I am helpful if someone is hurt, upset, or feeling ill). Items were rated on a 3-point Likert scale from 0 (not true) to 2 (certainly true). A mean score of the responses for all five items was created and utilized for subsequent analyses, with a higher score representing more adolescents' prosocial behaviors. Prior studies of Chinese adolescents have indicated the adequate psychometric properties of the prosocial behaviors subscale (Jiang et al., 2020; Zhou et al., 2022). In the present study, Cronbach's α coefficients for this subscale were 0.78, 0.80, and 0.81 at T1, T2, and T3, respectively.

Plan of Analyses

First, preliminary analyses were conducted to examine descriptive statistics and bivariate correlations among interest variables within and across time points in SPSS 21.0. Moreover, the intraclass correlations (ICCs) for parental warmth, harsh parenting, emotional problems, and prosocial behaviors were calculated in SPSS over three waves to briefly determine the proportion of variance explained by the between-person level. Finally, the longitudinal associations among parenting, emotional problems, and prosocial behaviors, including the reciprocal relations and mechanisms, were tested through RI-CLPMs in Mplus 8.3. Compared to the traditional CLPM, the RI-CLPM allows for the differentiation of between- (time-invariant) and within- (time-varying) individual levels of variance, which is advantageous in decreasing bias in directional estimates of associations and being more closely approximate causal inference (Berry & Willoughby, 2017;

Hamaker et al., 2015). In addition, two RI-CLPMs, one for parental warmth and one for harsh parenting, were estimated separately to investigate possible unique roles of different aspects of parenting. For the model evaluation, fitting indices included comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR), and proposed models were considered acceptable if values of CFI and TLI were at or above 0.90 and that of RMSEA and SRMR were at or below 0.08.

Results

Preliminary Analyses

Table 1 presents study variables' bivariate correlations, means, and standard deviations at each time point. As expected, parental warmth was negatively correlated with adolescents' emotional problems ($p < 0.01$), as well as positively correlated with adolescents' prosocial behaviors across three waves ($p < 0.001$). Further, there was evidence of low to moderate correlations between harsh parenting and adolescents' emotional problems from T1 to T3 ($p < 0.05$). For prosocial behaviors, significant concurrent and longitudinal bivariate correlations between harsh parenting and prosocial behaviors were found ($p < 0.05$), except for T1 harsh parenting and T3 prosocial behaviors. Associations between T2 emotional problems and prosocial behaviors at both T1 and T3 were small but significant ($p < 0.01$).

Concurrent and Prospective Associations Between Parenting, Emotional Problems, and Prosocial Behaviors

To isolate the between-person versus within-person variance, the present study used the RI-CLPM to explore the bidirectional relationships among parenting, adolescents' emotional problems, and prosocial behaviors. First, ICCs for main study variables were calculated. The ICCs were 0.40 for parental warmth, 0.39 for harsh parenting, 0.33 for emotional problems, and 0.34 for prosocial behaviors, suggesting that 40% of the variance in parental warmth, 39% of the variance in harsh parenting, 33% of the variance in emotional problems, and 34% of the variance in prosocial behaviors were explained by differences between persons, with the remaining variance of these variables were attributed to fluctuations within persons over time. Based on these results, it was concluded that the RI-CLPM could provide a reliable method for disaggregating variance between individuals and within individuals in longitudinal associations. Next, RI-CLPMs were conducted and

demonstrated an acceptable model fit (parental warmth: CFI = 1.000, TLI = 1.009, RMSEA = 0.001, SRMR = 0.008; harsh parenting: CFI = 0.998, TLI = 0.981, RMSEA = 0.028, SRMR = 0.011).

Results of the model for parental warmth are shown in Fig. 1 and Table 2. At the between-person level, the random intercepts between parental warmth and adolescents' emotional problems ($r = -0.46$, $p < 0.001$), as well as parental warmth and adolescents' prosocial behaviors ($r = 0.55$, $p < 0.001$), were moderately correlated, suggesting that adolescents experienced a higher level of parental warmth tended to report reduced emotional problems and increased prosocial behaviors, relative to other adolescents. The between-person association between emotional problems and prosocial behaviors was not significant ($p > 0.05$). At the within-person level, within-person changes in adolescents' prosocial behaviors predicted within-person changes in emotional problems six months later ($b = -0.14$, $SE = 0.06$, $p = 0.027$, $95\%CI = [-0.254, -0.015]$); likewise within-person changes in emotional problems at T2 further predicted within-person changes in prosocial behaviors at T3 ($b = -0.17$, $SE = 0.06$, $p = 0.004$, $95\%CI = [-0.290, -0.054]$). In addition, a child-driven effect was indicated, with greater adolescents' emotional problems at T2 predicting lower levels of parental warmth at T3 ($b = -0.14$, $SE = 0.07$, $p = 0.030$, $95\%CI = [-0.270, -0.014]$).

Results of the model for harsh parenting are shown in Fig. 2 and Table 3. At the between-person level, the random intercepts between harsh parenting and adolescents' emotional problems ($r = 0.41$, $p < 0.001$), as well as harsh parenting and adolescents' prosocial behaviors ($r = -0.32$, $p < 0.001$), were moderately correlated, suggesting that adolescents experienced a higher level of harsh parenting tended to report more emotional problems and less prosocial behaviors, relative to other adolescents. The between-person association between emotional problems and prosocial behaviors was not significant ($p > 0.05$). At the within-person level, adolescents' prosocial behaviors negatively predicted their emotional problems at T2 ($b = -0.15$, $SE = 0.06$, $p = 0.015$, $95\%CI = [-0.271, -0.030]$), which in turn negatively predicted prosocial behaviors at T3 ($b = -0.18$, $SE = 0.06$, $p = 0.003$, $95\%CI = [-0.303, -0.064]$). Different from parental warmth, a parent-driven effect was observed, with higher harsh parenting at T2 predicting adolescents' increased emotional problems later ($b = 0.14$, $SE = 0.07$, $p = 0.045$, $95\%CI = [0.003, 0.284]$).

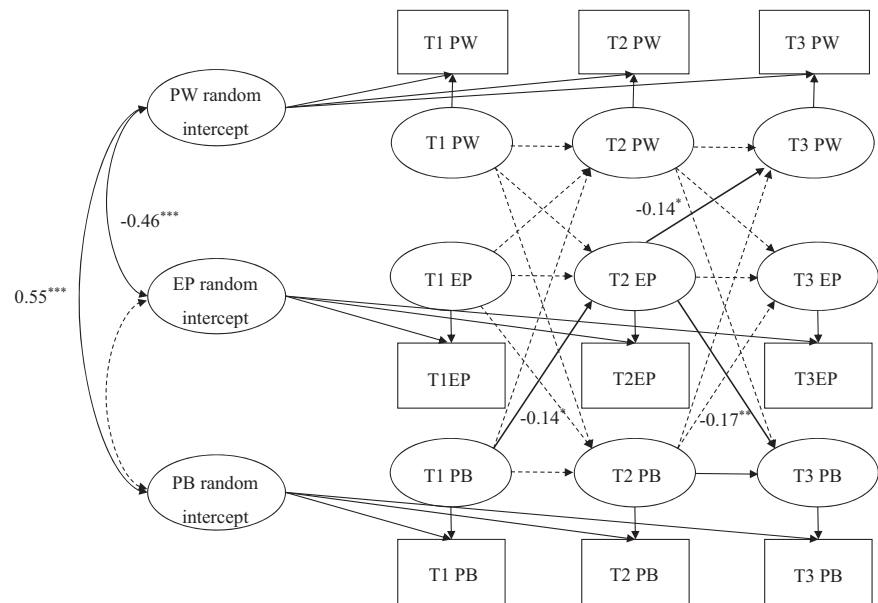
Moreover, the potential moderating role of gender in the bidirectional relationships between parental warmth/harsh parenting, emotional problems, and prosocial behaviors was examined using multi-group analyses. Cross-group equality constraints were imposed on the cross-lagged paths. The chi-square difference between the unconstrained and

Table 1 Descriptive statistics and correlations among main study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Gender	–																
2 Age	–0.01	–															
3 Paternal education	–0.01	–0.07	–														
4 Maternal education	–0.02	–0.04	0.64 ^{***}	–													
5 Family wealth	–0.02	–0.01	0.48 ^{***}	0.48 ^{***}	–												
6 T1 parental warmth	0.03	–0.05	0.01	–0.04	0.02	–											
7 T2 parental warmth	0.06	–0.01	0.01	–0.02	0.04	0.45 ^{***}	–										
8 T3 parental warmth	0.02	0.03	0.01	–0.05	0.02	0.37 ^{***}	0.39 ^{***}	–									
9 T1 harsh parenting	0.04	0.01	0.02	0.02	–0.01	–0.44 ^{***}	–0.29 ^{***}	–0.24 ^{***}	–								
10 T2 harsh parenting	0.03	–0.05	0.02	0.01	–0.03	–0.38 ^{***}	–0.48 ^{***}	–0.36 ^{***}	0.43 ^{***}	–							
11 T3 harsh parenting	0.10 [*]	–0.01	0.04	0.03	–0.02	–0.32 ^{***}	–0.28 ^{***}	–0.44 ^{***}	0.38 ^{***}	0.39 ^{***}	–						
12 T1 emotional problems	–0.02	0.12 ^{**}	–0.08	–0.09 [*]	–0.03	–0.23 ^{***}	–0.18 ^{***}	–0.13 ^{***}	0.28 ^{***}	0.14 ^{**}	0.15 ^{***}	–					
13 T2 emotional problems	–0.04	0.05	–0.06	–0.10 [*]	–0.05	–0.20 ^{***}	–0.29 ^{***}	–0.25 ^{***}	0.10 [*]	0.34 ^{***}	0.14 ^{**}	0.36 ^{***}	–				
14 T3 emotional problems	–0.03	–0.05	–0.11 ^{**}	–0.09 [*]	–0.07	–0.20 ^{***}	–0.18 ^{***}	–0.27 ^{***}	0.15 ^{***}	0.23 ^{***}	0.40 ^{***}	0.33 ^{***}	0.33 ^{***}	–			
15 T1 prosocial behaviors	–0.10 [*]	0.05	–0.02	–0.04	0.05	0.31 ^{***}	0.19 ^{***}	0.19 ^{***}	–0.12 ^{**}	–0.15 ^{***}	–0.16 ^{***}	0.01	–0.12 ^{**}	–0.03	–		
16 T2 prosocial behaviors	–0.05	0.01	–0.01	–0.02	0.13 ^{**}	0.24 ^{***}	0.40 ^{***}	0.20 ^{***}	–0.10 [*]	–0.20 ^{***}	–0.12 ^{**}	–0.02	–0.01	–0.02	0.32 ^{***}	–	
17 T3 prosocial behaviors	–0.06	0.01	–0.03	–0.06	–0.01	0.19 ^{***}	0.16 ^{***}	0.43 ^{***}	–0.04	–0.10 [*]	–0.15 ^{***}	–0.02	–0.12 ^{**}	0.05	0.32 ^{***}	0.38 ^{***}	–
<i>M</i>	–	13.80	3.44	3.21	13.72	2.25	2.15	2.09	2.08	2.22	2.17	0.50	0.63	0.68	1.52	1.51	1.45
<i>SD</i>	–	0.52	1.07	1.13	3.39	0.60	0.61	0.64	0.96	1.02	1.13	0.49	0.54	0.54	0.42	0.43	0.44

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

Fig. 1 Path Diagram of the RI-CLPM of parental warmth, emotional problems, and prosocial behaviors. Solid lines indicated significant paths



constrained model was not significant (parental warmth: $\Delta \chi^2 [12] = 12.69, p = 0.392$; harsh parenting: $\Delta \chi^2 [12] = 8.80, p = 0.720$), indicating the pattern of reciprocal relations were equivalent for girls and boys.

Sensitivity Analyses

The RI-CLPMs with time-invariant covariates for the observed variables (e.g., adolescents' age at T1, parents' educational level, and family wealth) were further tested. Similar to previous findings, two RI-CLPMs with covariates yielded acceptable fit across all indices of model fit (parental warmth: CFI = 0.994, TLI = 0.983, RMSEA = 0.020, SRMR = 0.020; harsh parenting: CFI = 0.990, TLI = 0.973, RMSEA = 0.024, SRMR = 0.021), and main findings showed the same pattern of statistical significance of the between-person correlations and within-person paths. These results provided further evidence of the longitudinal relationships among perceived parenting, emotional problems, and prosocial behaviors during adolescence.

Discussion

Given that few studies focused on the developmental cascade processes among different parenting dimensions and adolescents' psychosocial outcomes under distinguishing between- and within-person effects, this study investigated the potential bidirectional relationships among parental warmth, harsh parenting, adolescents' prosocial behaviors, and emotional problems over time using the RI-CLPM with a three-wave longitudinal design. The results indicated that, at the between-person level, significant associations

between two parenting dimensions and adolescents' emotional problems and prosocial behaviors were demonstrated. At the within-person level, adolescents' more prosocial behaviors at T1 predicted later within-person decreases in their emotional problems at T2, which in turn lead to subsequent increased prosocial behaviors and more parental warmth at T3. Additionally, higher levels of harsh parenting at T2 predicted adolescents' more emotional problems at T3, but not vice versa.

Consistent with previous studies (Lan, 2022; Lansford et al., 2014; Padilla-Walker et al., 2016), at the between-person level, this study found that parental warmth was positively associated with adolescents' prosocial behaviors and negatively associated with their emotional problems. For harsh parenting, a negative association between harsh parenting and adolescents' prosocial behaviors was found, as well as a positive association between harsh parenting and emotional problems. These results proposed that compared with adolescents whose parents showed lower mean levels of warmth and higher mean levels of harsh parenting, those who experienced higher mean levels of parental warmth and lower mean levels of harsh parenting were more likely to perform more prosocial behaviors and fewer emotional problems.

Although prosocial behaviors and emotional problems were not associated with each other at the between-person level, the present study found adolescents' more prosocial behaviors at T1 predicted later within-person decreases in their emotional problems at T2, which in turn led to subsequent increased prosocial behaviors at T3 at the within-person level. Prosocial behaviors might be a protective factor for developing emotional problems in adolescence (Eisenberg et al., 2024). Adolescents who report more

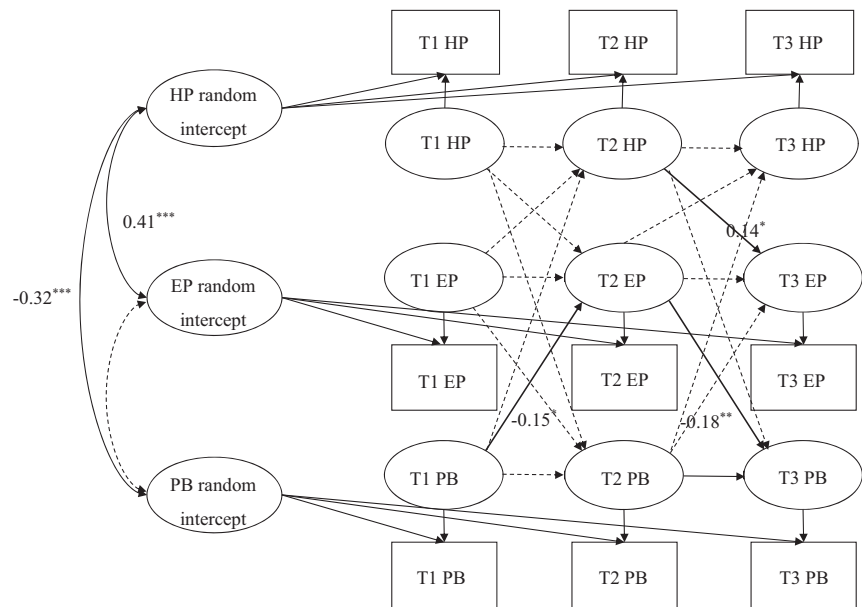
Table 2 Parameter estimation results of the RI-CLPM of parental warmth, emotional problems, and prosocial behaviors

Parameter	<i>b</i>	<i>SE</i>	<i>p</i>	95%CI
Autoregressive paths				
T1PW → T2PW	0.13	0.07	0.065	[-0.008, 0.267]
T1EP → T2EP	0.04	0.07	0.541	[-0.091, 0.174]
T1PB → T2PB	0.01	0.07	0.988	[-0.139, 0.141]
T2PW → T3PW	0.02	0.08	0.806	[-0.136, 0.175]
T2EP → T3EP	-0.02	0.07	0.786	[-0.163, 0.123]
T2PB → T3PB	0.15	0.07	0.030	[0.015, 0.292]
Cross-lagged paths				
T1PW → T2EP	-0.02	0.06	0.785	[-0.144, 0.109]
T1EP → T2PW	-0.04	0.06	0.566	[-0.156, 0.085]
T1PW → T2PB	0.08	0.07	0.223	[-0.049, 0.210]
T1PB → T2PW	-0.02	0.06	0.797	[-0.135, 0.104]
T1EP → T2PB	0.01	0.06	0.957	[-0.121, 0.128]
T1PB → T2EP	-0.14	0.06	0.027	[-0.254, -0.015]
T2PW → T3EP	-0.03	0.07	0.695	[-0.171, 0.114]
T2EP → T3PW	-0.14	0.07	0.030	[-0.270, -0.014]
T2PW → T3PB	-0.11	0.07	0.076	[-0.241, 0.012]
T2PB → T3PW	0.03	0.07	0.670	[-0.105, 0.163]
T2EP → T3PB	-0.17	0.06	0.004	[-0.290, -0.054]
T2PB → T3EP	0.03	0.07	0.693	[-0.109, 0.163]
Correlations				
T1PW ↔ T1EP	-0.10	0.06	0.061	[-0.224, 0.005]
T1PW ↔ T1PB	0.20	0.06	0.001	[0.084, 0.308]
T1EP ↔ T1PB	0.04	0.06	0.499	[-0.075, 0.153]
T2PW ↔ T2EP	-0.20	0.07	0.003	[-0.322, -0.067]
T2PW ↔ T2PB	0.32	0.06	<0.001	[0.202, 0.438]
T2EP ↔ T2PB	0.04	0.07	0.561	[-0.094, 0.174]
T3PW ↔ T3EP	-0.17	0.06	0.003	[-0.283, -0.059]
T3PW ↔ T3PB	0.36	0.05	<0.001	[0.268, 0.458]
T3EP ↔ T3PB	0.10	0.06	0.059	[-0.004, 0.214]
I_{PW} ↔ I_{EP}	-0.46	0.08	<0.001	[-0.615, -0.303]
I_{PW} ↔ I_{PB}	0.55	0.08	<0.001	[0.390, 0.708]
I _{EP} ↔ I _{PB}	-0.08	0.09	0.428	[-0.269, 0.114]

PW parental warmth, EP emotional problems, PB prosocial behaviors, I_{PW} Intercept PW, I_{EP} Intercept EP, I_{PB} = Intercept PB

Significant results were bolded

Fig. 2 Path Diagram of the RI-CLPM of harsh parenting, emotional problems, and prosocial behaviors



prosocial behaviors could show optimal levels of self-regulation, positive self-views and peer interactions, have better social performance, be liked by peers in the classroom, and thus have a higher level of mental health and fewer emotional problems (Asgarabad et al., 2023; Flouri & Sarmadi, 2016); in turn, at times when their emotional problems were decreased, they tended to be more confident and self-sufficient, engage in positive social interactions with peers, teachers, and families, have more chances to practice social skills and perform more prosocial acts over time (Memmott-Elison et al., 2020; Padilla-Walker et al., 2015). Conversely, adolescents with diminished prosocial behaviors were prone to experience poorer quality of social interactions, more peer rejection, and a decreased likelihood of receiving positive responses from peers, which may contribute to more emotional problems. Increased emotional problems possibly through accumulated failure experiences in social domains finally point to a decrease in social or behavioral adjustment including fewer prosocial behaviors. These results demonstrated the possible cascade relationships between prosocial behaviors and emotional problems in a relatively short term. It is noteworthy that there may be the cumulative effects of cascade processes between prosocial behaviors and emotional problems, with the reciprocal relationships between them strengthening over longer-term follow-up, as prior studies indicated (Memmott-Elison & Toseeb, 2023).

For within-person relationships between two parenting dimensions and adolescents' emotional problems, the present study demonstrated that adolescents' emotional problems at T2 predicted their perception of parental warmth at T3 but not vice versa. Emotional problems are considered as a wide range of experienced emotional symptoms including

depression, anxiety, and somatization (Goodman, 2001). Adolescents with more emotional problems may tend to withdraw from interpersonal situations including communications and interactions with their parents and yield a child-driven effect, which may lead to reduced parental warmth and diminished perceived parental support (Boele et al., 2023; Lansford et al., 2018; Serbin et al., 2015). In terms of harsh parenting and emotional problems, a significant path from harsh parenting at T2 to adolescents' emotional problems at T3 has been observed. Higher harsh parenting as stressful experiences in the family may make adolescents suffer from emotional overarousal and cognitive depletion and cannot disengage from negative emotions and thoughts, which would increase the likelihood of their emotional problems later (Bauer et al., 2022; Hidalgo et al., 2023; Wang et al., 2015). In addition, the results mentioned above were observed only across T2 and T3 instead of from T1 to T2. With increasing age, adolescents evaluate the behaviors of their parents more realistically, critically, and de-ideally, which may explain the discrepancy patterns of relations between parenting and adolescents' adjustment across the studied time lags (Levpušček, 2006). The present study did not find a significant longitudinal impact of parental warmth on adolescents' emotional problems and the influence of emotional problems on harsh parenting over time. Parental discipline and hostility tend to peak in adolescence, and adolescents are most sensitive to recent incidents of harsh parenting (Akcinar & Baydar, 2016), while perceived parental warmth may have a significant effect changes in adolescents' emotional problems at a much longer timescale rather than short-term (Boele et al., 2023). On the other hand, adolescents with more emotional problems were prone to withdraw in parent-child relationships

Table 3 Parameter estimation results of the RI-CLPM of harsh parenting, emotional problems, and prosocial behaviors

Parameter	<i>b</i>	<i>SE</i>	<i>p</i>	95%CI
Autoregressive paths				
T1HP → T2HP	0.10	0.07	0.168	[-0.041, 0.237]
T1EP → T2EP	0.06	0.07	0.380	[-0.074, 0.195]
T1PB → T2PB	0.02	0.07	0.808	[-0.127, 0.162]
T2HP → T3HP	0.01	0.08	0.862	[-0.145, 0.173]
T2EP → T3EP	-0.05	0.08	0.520	[-0.195, 0.099]
T2PB → T3PB	0.13	0.07	0.051	[-0.001, 0.265]
Cross-lagged paths				
T1HP → T2EP	-0.09	0.07	0.191	[-0.213, 0.042]
T1EP → T2HP	-0.04	0.06	0.560	[-0.160, 0.087]
T1HP → T2PB	0.01	0.07	0.990	[-0.131, 0.133]
T1PB → T2HP	-0.04	0.06	0.486	[-0.165, 0.079]
T1EP → T2PB	-0.02	0.07	0.808	[-0.143, 0.112]
T1PB → T2EP	-0.15	0.06	0.015	[-0.271, -0.030]
T2HP → T3EP	0.14	0.07	0.045	[0.003, 0.284]
T2EP → T3HP	-0.02	0.07	0.794	[-0.157, 0.120]
T2HP → T3PB	0.06	0.06	0.366	[-0.068, 0.184]
T2PB → T3HP	-0.01	0.07	0.947	[-0.138, 0.129]
T2EP → T3PB	-0.18	0.06	0.003	[-0.303, -0.064]
T2PB → T3EP	0.02	0.07	0.750	[-0.107, 0.149]
Correlations				
T1HP ↔ T1EP	0.20	0.06	0.001	[0.095, 0.313]
T1HP ↔ T1PB	-0.02	0.06	0.778	[-0.134, 0.100]
T1EP ↔ T1PB	0.04	0.06	0.539	[-0.079, 0.152]
T2HP ↔ T2EP	0.31	0.06	<0.001	[0.188, 0.432]
T2HP ↔ T2PB	-0.14	0.07	0.040	[-0.274, -0.007]
T2EP ↔ T2PB	0.02	0.07	0.749	[-0.114, 0.158]
T3HP ↔ T3EP	0.39	0.05	<0.001	[0.283, 0.496]
T3HP ↔ T3PB	-0.08	0.06	0.143	[-0.194, 0.028]
T3EP ↔ T3PB	0.08	0.06	0.152	[-0.029, 0.189]
I_{HP} ↔ I_{EP}	0.41	0.08	<0.001	[0.262, 0.565]
I_{HP} ↔ I_{PB}	-0.32	0.09	<0.001	[-0.498, -0.138]
I _{EP} ↔ I _{PB}	-0.04	0.09	0.665	[-0.238, 0.152]

HP harsh parenting, *I_{HP}* intercept *HP*

Significant results were bolded

and thus evoke less parental engagement and fewer stimulating interactions (Boele et al., 2023) instead of causing more stressful family situations and eliciting parents to become increasingly angry and punitive.

Moreover, fluctuations in parental warmth and prosocial behaviors could not directly predict one another over time at the within-person level in the present study. Comparable results were revealed in harsh parenting and prosocial behaviors as well. One possible explanation is that adolescence is a critical stage involving major changes (Mastrotheodoros et al., 2020). When adolescents see themselves as experiencing more challenges and difficulties, they tend to hold a negative attribution to themselves and their surroundings (Lee et al., 2019). Relative to adaptive adjustment such as prosocial behaviors, external environmental factors may be more closely longitudinally related to adolescents' within-person changes of their problems in this developmental period. Notably, from the RI-CLPMs, this study found a potential indirect cascade pathway, with adolescents' prosocial behaviors at T1 predicting their emotional problems at T2 and fluctuations in emotional problems predicting subsequent fluctuations in parental warmth at T3. This finding implied that adolescents' own emotional problems might be a potential mechanism explaining the longitudinal child-driven effect of their social or behavioral adjustment on parental warmth as a crucial component of the family system, which supported the views of the developmental cascade model (Masten & Cicchetti, 2010).

There were some strengths in the present study. Theoretically, the findings of the study enriched the understanding of the developmental cascade model by demonstrating cross-domain and cross-system effects between parenting, emotional problems, and prosocial behaviors in adolescents. Practically, this study has implications by indicating the child- or parent-driven associations between different aspects of parenting and adolescents' emotional problems, showing preventive interventions to address adolescents' emotional problems may primarily focus on parent-focused components, especially on decreasing harsh parenting. Meanwhile, the findings suggested that increasing prosocial behaviors should be the target of mental health prevention programs, which would promote positive cascades by fostering their emotional adjustment and then strengthening close and warm relationships between parents and adolescents over time.

Several limitations of this study should be considered. First, all measures were self-reported by adolescents, which may lead to self-presentation biases. Future research should attempt to utilize multiple informants to reduce such potential biases. Second, this study only focused on the longitudinal and bidirectional associations among parenting, emotional problems, and prosocial behaviors over one year in three waves. Future studies could further investigate

the developmental cascade relationships among them by employing a multi-wave cohort study to capture more comprehensive developmental changes. Finally, overall emotional problems were considered a core aspect of poor emotional adjustment in the present study, and possible differential roles of specific mental health problems such as depression and anxiety should be addressed separately in future studies.

Conclusion

Though previous studies investigated the reciprocal relationships between parenting and adolescents' psychosocial outcomes, the present study addresses a gap in the existing literature by examining the longitudinal reciprocal relationships between different parenting dimensions (i.e., parental warmth and harsh parenting), adolescents' prosocial behaviors, and emotional problems under distinguishing between- and within-person levels. This study found that adolescents' more prosocial behaviors at T1 predicted later within-person decreases in their emotional problems at T2, which in turn led to both increased prosocial behaviors and parental warmth at T3. Moreover, harsh parenting positively predicted adolescents' emotional problems from T2 to T3. The results of the study highlighted the developmental cascade processes among adolescents' prosocial behaviors, emotional problems, and parenting and positioned cultivating adolescents' prosocial behaviors could be targeted to alleviate future emotional problems and benefit broader adjustment outcomes.

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Data Sharing Declaration The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval Ethical approval for the present study was obtained from the local ethics committee.

Informed Consent Informed consent was obtained from all participants.

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