



Parent- and Child-Driven Daily Family Stress Processes between Daily Stress, Parental Warmth, and Adolescent Adjustment

Jingyi Xu ¹ · Yao Zheng ¹

Received: 7 September 2022 / Accepted: 8 October 2022 / Published online: 22 October 2022

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2022

Abstract

Emerging evidence suggests that family members' stress and family interactions vary across days. This study examined the daily associations among parental and adolescent daily stress, parental warmth, and adolescent adjustment with a 30-day daily diary study among 99 ethnically diverse Canadian parent–adolescent dyads (54% White, 23% Asian, 9% multiracial, $M_{\text{age}} = 14.5$, 55% female). Multilevel structural equation modeling revealed a negative within-day link between parental daily stress and parental warmth, and positive within-day links between adolescent daily stress and their emotional problems and negative affect. Parental warmth was positively associated with the next day's adolescent positive affect and prosocial behaviors, and explained the cross-day link between parental daily stress and adolescent adaptive outcomes. The findings indicate parent-driven effects in daily family stress processes.

Keywords Daily diary · Daily family stress processes · Parental warmth · Daily stress · Adolescent adjustment

Introduction

Parenting practices have potent impacts on various aspects of adolescent socioemotional and behavioral development (Hoeve et al., 2009; Semtana & Rote, 2019). There are reciprocal and dynamic relations between parenting practices and child behaviors over development (Paschall & Mastergeorge, 2016), both of which are influenced by experiences within and outside the family (Belsky, 1984; Lippold et al., 2016). Emerging evidence suggests that family members' daily stress, experiences, and family interactions vary from one day to another (Brenning et al., 2022; Fosco & Lydon-Staley, 2020), but scarce research has investigated the within-family associations between family members' daily stress, parenting behaviors, and child adjustment at the daily level. The current study sought to explore the parent-driven processes in the cross-day associations between parental daily stress, parental warmth, and various adolescent emotional and behavioral adjustment, as well as the child-driven processes in the daily associations

among adolescent daily stress, their adjustment, and parental warmth in response to different adolescent behaviors.

Parental and Adolescent Stress in Daily Lives

Individual and familial stressors may impede child developmental processes through interrupting family dynamics and interactions. For instance, the family stress model posits that familial economic hardship hinders children's developmental competences through inducing parental psychological distress, triggering disrupted parenting, and escalating tensions among family members (Masarik & Conger, 2017). In addition, researchers have documented the work-family spillover effect, such that stresses that one experiences in their work domain can be transmitted into their family life and interrupt their family obligation and interactions (Almeida et al., 1999; Bolger et al., 1989). Finally, parental psychopathology and mental health problems (e.g., parental anxiety and depression) are positively linked to negative and maladaptive parenting (Crosby Budinger et al., 2013; Lovejoy et al., 2000; McCabe, 2014), which may ultimately impede child developmental processes.

Previous studies have primarily focused on the role of major and/or chronic stressors (e.g., financial difficulty, parental psychopathology; Lovejoy et al., 2000; Masarik & Conger, 2017) in family processes. However, both parents and adolescents may experience minor unpleasant and

✉ Yao Zheng
yao.zheng@ualberta.ca

¹ Department of Psychology, University of Alberta, P-349 Bio Science Building, Edmonton, AB T6G 2E9, Canada

stressful events of various types, frequencies, and severities in daily lives, which may have both short- and long-term impact on individual well-being (Almeida, 2005; DeLongis et al., 1982; Zheng et al., 2022). Notably, despite their short-lived nature, daily stressors likely exert pertinent and salient impacts on *daily* family process and individual well-being given their recurring and cumulative nature (Almeida, 2005). Existing longitudinal studies primarily examined the family stress processes on a macro timescale spanning across multiple years. Nonetheless, family members' experiences and family interactions happen at the daily level, and differences in family dynamics can happen both at the between-person level (i.e., the rank order of one's experiences and behaviors relative to other people) and at the within-person level (i.e., the changes of individuals' experiences and behaviors relative to their average levels across time; Keijsers, 2016). Further, family processes observed at the macro timescale may not necessarily generalize to the micro timescale (e.g., seconds, hours, days; Aunola et al., 2013; Boele et al., 2020; Keijsers et al., 2022). Thus, there remains limited knowledge on the dynamic processes linking family stress and child well-being in families' daily lives.

A growing body of research has employed daily diary methods to elucidate the proximal dynamics of family processes in daily lives (Keijsers et al., 2022; Laurenceau & Bolger, 2005). Research has demonstrated robust daily links between parental stress and parenting behaviors or parent–child interactions. Specifically, on days when parents experience high stress (e.g., parental, home, or work stress), they tend to show more negative parenting behaviors (e.g., psychological control; Malinen et al., 2017), have more parent–child conflicts (e.g., Mastrotheodoros et al., 2020; Nelson et al., 2017), and experience lower levels of parent–infant closeness (Feinberg et al., 2019). Moreover, parental emotional exhaustion fully explains the within-day link between parental work–family conflict and parental controlling behaviors towards toddlers (Brenning et al., 2022). Regarding adolescents' daily stress, a paucity number of studies have shown that adolescents tend to report higher levels of depressed mood and negative affect on days with more stressful events (Lippold et al., 2016; White & Shih, 2012; Zheng et al., 2022). Collectively, these findings indicate the pivotal roles of family members' daily stressors in their daily functioning, and more studies are needed to understand these associations at the daily level.

Reciprocal Associations of Parent–Adolescent Interactions in Daily Lives

Parenting practices do not influence child development unidirectionally. Family and developmental theories have suggested that children and adolescents do not passively

internalize parenting practices, but could also elicit and alter parenting behaviors, demonstrating the bidirectional nature of parent–child interactions (Belsky, 1984; Cox & Paley, 1997). For instance, parents may respond to children's maladaptive behaviors in a negative and controlling way as parents may perceive their children as difficult and defiant, which could trigger more rebellious behaviors of the children and result in a vicious cycle within the parent–child dyad (Belsky, 1984). Meta-analyses have accordingly documented parent-driven (Hoeve et al., 2009; Pinquart, 2017), child-driven (Yan et al., 2021), or reciprocal associations (Paschall & Mastergeorge, 2016) between various parenting behaviors (e.g., warmth, sensitivity, support, harsh discipline, rejection) and child adjustment (e.g., externalizing and delinquent behaviors, internalizing behaviors) throughout infancy and adolescence.

Some recent studies have explored the daily links between parenting practices and various child outcomes. For instance, within the same day, adolescent-reported parental support was positively associated with adolescents' need satisfaction, and negatively with adolescents' negative mood (Janssen et al., 2021; Laporte et al., 2022). Nonetheless, in an 8-day daily diary study among 9- to 17-year-olds in the U.S., adolescent-reported parent–adolescent negative (but not positive) interactions were positively associated with their physical health problems (e.g., headache, tiredness, stomachache) on the same day (Lippold et al., 2016). Scarce studies have explored the cross-day links between parenting practices and child development. As some rare exceptions, among 8- to 12-year-olds in Belgium, van der Kaap-Deeder et al. (2017) found a cross-day positive association between child-perceived maternal psychological control and children's negative affect, as well as a cross-day negative association between maternal psychological control and children's positive affect. Wang et al. (2021) reported that during the COVID-19 pandemic, U.S. adolescent-reported parental support was negatively related to adolescent negative affect and positively to adolescent positive affect within the same day. However, the cross-day association was only found between parental support and adolescent positive, but not negative, affect.

Relative to the parent-driven effects, fewer studies have explored the daily child-driven or reciprocal effects of parent–child interactions (but see Bai et al., 2017; Fosco et al., 2021). More importantly, scarce studies have examined the child-driven or reciprocal effects of parent–child interactions in cross-day contexts, and extant results yielded inconsistent conclusions. Specifically, in a 7-day daily diary study, Finnish 1st graders' negative emotions were negatively linked with parental psychological control on the next day, while parental psychological control was positively linked with children's negative emotions on the next day (Aunola et al., 2013). Xu and Zheng (2022) revealed

bidirectional cross-day links between parental psychological control and adolescent emotional problems, although the patterns differed based on parent–adolescent convergency versus divergency in perceiving those behaviors. In a group of Dutch adolescents and over two weeks, Boele et al. (2022) found neither parent- nor child-driven effects between parental support and adolescents' depressive symptoms and negative affect across days. Finally, in a 21-day daily diary study among 13–16-year-olds, adolescent anger was positively linked to parent-reported parent–adolescent conflict of the next day, but adolescent-reported parent–adolescent conflict was negatively linked to parental anger of the next day (LoBraico et al., 2020). The inconsistent findings suggest that the mechanisms between parenting and child outcomes may vary across the assessed timescales (i.e., within or across days), durations, specific measures, or historical contexts (e.g., major societal challenges such as COVID-19 pandemic). More studies are sorely needed to understand the mutual influences of parental and adolescent behaviors in daily lives.

Despite that some previous daily diary studies have separately investigated the daily relations of daily stress with individual well-being (Lippold et al., 2016; Zheng et al., 2022) and parenting behaviors (Malinen et al., 2017), and the links between daily family interactions and child outcomes (Laporte et al., 2022; Janssen et al., 2021), scant studies have explored the daily mechanisms among family members' daily stress, parenting behaviors, and child outcomes in daily contexts. As a few notable exceptions, Chung et al. (2009) found that parent–adolescent conflict fully explained the within-day positive link between interparental conflict and adolescent emotional distress among a group of ethnically diverse 12th graders in the U.S. over two weeks. Schmidt and colleagues (2021) recently found in a 21-day diary study that within the same day, negative parent–child interactions partially explained the association between parental daily stress and 6- to 19- year-old German children's positive and negative affect during the COVID-19 pandemic. However, neither study examined the child-driven or reciprocal processes underlying family members' daily stress, parenting behaviors, and adolescent adjustment.

Current Study

Increasing evidence has documented the prominent roles of family members' daily stress in informing family interactions and adolescent well-being, as well as the bidirectional associations between parenting practices and adolescent adjustment. Nonetheless, less is known about the family processes that link family members' daily stress, parenting behaviors, and adolescent adjustment at the daily level. Therefore, the present study aimed to fill this literature gap.

Specifically, this study examined the relations between parental daily stress, parental warmth, and various adolescent emotional and behavioral adjustment (i.e., positive and negative affect, prosocial behaviors, emotional problems). It was hypothesized that parents who experienced higher than their average levels of daily stress would show lower than their average levels of parental warmth on the same day, which in turn would be positively associated with adolescent positive affect and prosocial behaviors, and negatively with adolescent emotional problems and negative affect, on the next day. Simultaneously, this study also examined the relations from adolescents' daily stress to parental warmth through adolescent behaviors to investigate the potential reciprocal associations of parent–adolescent daily interactions. Specifically, within the same day, it was anticipated that adolescents' daily stress would be negatively associated with their positive affect and prosocial behaviors, and positively with their emotional problems and negative affect. Furthermore, adolescents with higher than their average levels of positive affect and prosocial behaviors would elicit higher than their average levels of parental warmth on the next day, while adolescents with higher than their average levels of emotional problems and negative affect would evoke lower than their average levels of parental warmth on the next day.

Methods

Participants and Procedures

The participants included 99 ethnically diverse parent–adolescent dyads recruited from western Canada. Adolescents' ages ranged between 12 and 17 years old ($M = 14.52$, $SD = 1.77$, 1.01% missing age information, 54.54% female). Adolescents identified themselves as White (53.54%), Asian (23.23%), multiracial (9.09%), Latino or Hispanic (4.04%), Black or African (2.02%), and other (7.07%, 1.01% missing ethnic information). Parents' ages ranged between 30 to 60 years old ($M = 43.66$, $SD = 6.18$, 71.72% female, 2.02% missing age and sex information). Slightly over half (57.58%) of the parents self-identified as White, 28.28% Asian, 4.04% Latino or Hispanic, 2.02% Black or African, 2.02% multiracial, and 2.02% other (4.04% missing). Parental personal annual income ranged from below \$35,000 (18.18%), to above \$65,000 (38.38%), with 9.09% between \$35,000 and \$45,000, 12.12% between \$45,000 and \$55,000, 18.18% between \$55,000 and \$65,000 (4.04% missing). The primary analyses (i.e., the daily associations between parental and adolescent daily stress, parental warmth, and adolescent adjustment outcomes) included 87 parent–adolescent dyads. Parent–adolescent dyads were excluded by the program by

default because they had missingness on at least one of the exogenous variables (i.e., parental or adolescent daily stress at day t and day $t+1$, parental warmth or adolescent adjustment at day $t-1$) within each daily report. Among those participants, parents on average completed 25.78 days of reports (96.63% ≥ 20 days), and adolescents on average completed 23.51 daily reports (86.52% ≥ 20 days).

Data were collected from February 2019 to October 2020. This study was approved by the Research Ethics Board at University of Alberta. Newsletters and flyers were distributed around a western Canadian province, and study information was posted on social medias to recruit potential participants. People who reached out to the research team were informed by trained research assistants that the study aimed to understand their daily experiences, moods, and socioemotional development of parent–adolescent pairs. Parents and adolescents who were interested and agreed in participation received online consent and assent forms, and they also received an online baseline survey. Five days after submitting the baseline survey, parents and adolescents, respectively, received an online daily survey at 5 pm each day, for a consecutive 30 days. Participants were instructed to fill out the daily survey before their bedtime. Parents and adolescents who completed the 30-day daily survey received a \$45 e-gift card, respectively, as a compensation for their participation.

Measures

Daily stress

Parents and adolescents respectively reported their own daily stress in different life aspects (e.g., work, family, health) using modified items selected from the Hassles Scale (Kanner et al., 1981). Specifically, parents and adolescents reported whether certain minor life events (e.g., “have troublesome neighbors,” “overload with family responsibilities,” 13 and 19 items for parent- and adolescent-reports, respectively; Appendix A) happened (1 = *yes*) or not (0 = *no*) on that day. All item scores were averaged to form a composite score, with higher scores representing higher levels of daily stress on that day. Multilevel ordinal ω s were calculated following the guideline in Geldhof et al. (2014). The within-level reliabilities were 0.82 and 0.88, for parent- and adolescent-reported daily stress, respectively. At the between-level, the ω s for parent- and adolescent-reported daily stress were 0.93 and 0.97, respectively.

Parental warmth

Adolescents reported their perceived parental warmth on a daily basis (1 = *almost never true*, 2 = *rarely true*, 3 = *sometimes true*, 4 = *almost always true*) on 6 items

(e.g., “My parents treated me nice and kind today.” “My parents said nice things about me today.”) modified from previous studies (Artemis & Touloumakos, 2016; Quach et al., 2015). A composite score was formed by averaging all item scores, with higher scores represented higher levels of parental warmth of that day. The within- and between-level ordinal ω s were 0.90 and 0.98, respectively.

Positive and negative affect

Adolescents reported their daily positive affect (five items, e.g., “active,” “inspired”) and daily negative affect (five items, e.g., “upset,” “ashamed”) using the short form Positive and Negative Affect Schedule (Thompson, 2007). Daily affect was rated on a 5-point Likert scale ranging from 1 = *very slightly or not at all* to 5 = *extremely*. Within each subscale, item scores were averaged to form a composite of positive and negative affect of that day, respectively. The within-level ω s were 0.63 and 0.74 for positive and negative affect, respectively. The between-level ω s were 0.87 and 0.94 for positive and negative affect, respectively.

Prosocial behaviors

Adolescents reported their daily prosocial behaviors with the prosocial behaviors subscale of the Strengths and Difficulty Questionnaire (five items, e.g., “I am helpful if someone is hurt, upset or feeling ill.” Goodman et al., 1998) from 0 (*not true*) to 2 (*certainly true*), and the item average score was used to represent their daily prosocial behaviors. The within- and between-level ordinal ω s were 0.77 and 0.92, respectively.

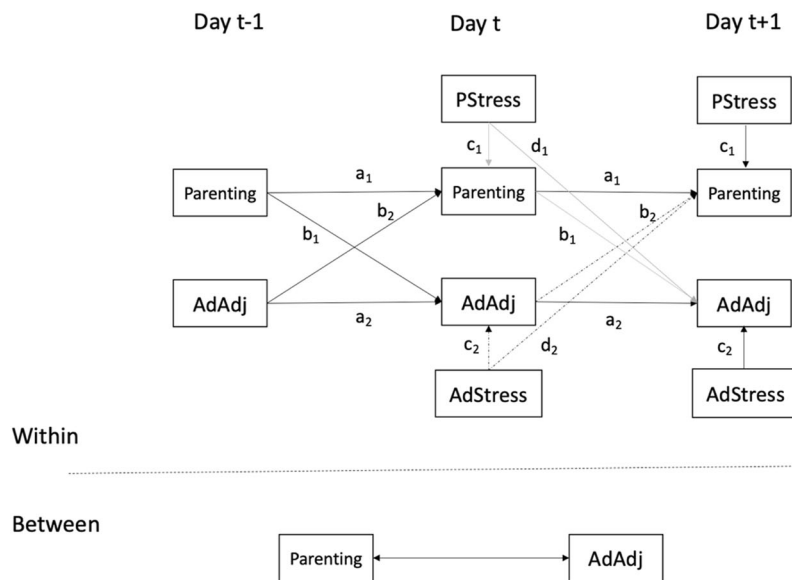
Emotional problems

Adolescent emotional problems were measured with the 5-item emotional problems subscale drawn from the Strengths and Difficulty Questionnaire (e.g., “I am unhappy, depressed, tearful.” Goodman et al., 1998) that was rated from 0 (*not true*) to 2 (*certainly true*), and all item scores were averaged to form a composite of emotional problems of that day. The within- and between-level ordinal ω s were 0.73 and 0.94, respectively.

Analytic Strategies

All variables were person-mean centered. To estimate autoregressive and cross-lagged effects, lagged variables were first manually created in SPSS 28 for day $t-1$ and day t , respectively. Primary analyses were done in Mplus 8.3 (Muthén & Muthén, 1998–2017). Following the conceptual model in Fig. 1, multilevel SEMs (MLSEM) were estimated. Specifically, at the within level, autoregressive paths

Fig. 1 Conceptual Model. P Stress = parental daily stress; AdStress = adolescent daily stress; AdAdj = adolescent adjustment. Parent-driven effect was presented in gray solid lines; child-driven effect was presented in gray dashed lines



for parental warmth (path a_1 in Fig. 1) and adolescent adjustment (path a_2 ; each outcome was estimated in separate models) were estimated across days. To estimate the bidirectional associations between parental warmth and adolescent adjustment, cross-lagged paths were estimated across days (paths b_1 and b_2). Additionally, on both day t and day $t + 1$, paths were estimated from parent-reported daily stress to the same day's parental warmth (path c_1), and from adolescent-reported daily stress to the same day's adolescent adjustment (path c_2). Furthermore, direct paths were estimated from day t parent-reported daily stress to day $t + 1$ adolescent adjustment (path d_1), as well as from day t adolescent-reported daily stress to day $t + 1$ parental warmth (path d_2).

The parent-driven indirect effect was calculated as the product of the path from parent-reported daily stress to parental warmth on day t and the path from parental warmth on day t to adolescent adjustment on day $t + 1$ (i.e., $c_1 \times b_1$). Simultaneously, the child-driven indirect effect was calculated as the product of the path from adolescent-reported daily stress to adolescent adjustment on day t and the path from adolescent adjustment on day t to parental warmth on day $t + 1$ (i.e., $c_2 \times b_2$). Lastly, residual covariance between parental warmth and adolescent adjustment were estimated within day t and day $t + 1$, respectively. The same paths within (e.g., parental daily stress predicted parental warmth on day t and day $t + 1$, respectively, path c_1) or across days (e.g., parental warmth predicted adolescent adjustment from day $t - 1$ to day t , and from day t to day $t + 1$, path b_1) were constrained to be the same. Across days, the residual variance of the same construct (e.g., parental warmth on day t and day $t + 1$), and the residual covariance of endogenous variables (e.g., residual covariance between parental warmth and adolescent adjustment on day t and day $t + 1$, respectively)

were also constrained to be the same. At the between level, the random intercepts of parental warmth and adolescent adjustment were estimated, as well as the covariance between these random intercepts. Linear trend was controlled for if necessary for the endogenous variables (i.e., parental warmth, adolescent adjustment on day t and day $t + 1$, respectively). Preliminary results indicated that only adolescent emotional problems had a significant and negative linear trend. All models were estimated with the Maximum Likelihood with robust standard error (MLR) estimator.

Results

Descriptive Statistics

In general, there were more significant correlations at the between-, as opposed to at the within-level. At both levels, parental stress was negatively correlated with parental warmth ($r_b = -0.23$, $r_w = -0.08$, $ps = 0.030$ and 0.004 , respectively), and positively with adolescent emotional problems ($r_b = 0.32$, $r_w = 0.06$, $ps = 0.004$ and 0.024 , respectively) and negative affect ($r_b = 0.33$, $r_w = 0.06$, $ps = 0.006$ and 0.003 , respectively). At the between level, parental stress was negatively correlated with adolescent prosocial behaviors ($r = -0.30$, $p = 0.003$). At the between-level, adolescent stress was negatively correlated with adolescent positive affect and prosocial behaviors ($r = -0.30$, $p = 0.003$; $r = -0.37$, $p < 0.001$, respectively), but positively with adolescent emotional problems and negative affect ($rs = 0.76$ and 0.80 , $ps < 0.001$). At the within-level, adolescent stress was positively correlated with emotional problems and negative affect ($rs = 0.35$, $ps < 0.001$). At both levels, parental warmth was positively

Table 1 Descriptive statistics of study variables

	1	2	3	4	5	6	7
1. PStress	–	0.42 ^{***}	–0.23 [*]	–0.07	–0.30 ^{**}	0.32 ^{**}	0.33 ^{**}
2. AdStress	0.07	–	–0.60 ^{***}	–0.30 ^{**}	–0.37 ^{***}	0.76 ^{***}	0.80 ^{***}
3. Warm	–0.08 ^{**}	–0.05	–	0.54 ^{**}	0.51 ^{***}	–0.49 ^{***}	–0.38 ^{***}
4. PosAff	–0.01	–0.03	0.14 ^{***}	–	0.43 ^{***}	–0.36 ^{***}	–0.12
5. Prosocial	–0.01	–0.07	0.21 ^{***}	0.17 ^{***}	–	–0.17	–0.16
6. Emo	0.06 [*]	0.35 ^{***}	–0.08 [*]	–0.07	0.02	–	0.86 ^{***}
7. NegAff	0.06 ^{**}	0.35 ^{***}	–0.09 [*]	0.08	–0.08 ^{**}	0.50 ^{***}	–
<i>M</i>	0.15	0.24	3.22	2.67	1.56	0.44	1.59
<i>SD</i>	0.17	0.25	0.84	0.94	0.44	0.51	0.79
ICC	0.64	0.77	0.75	0.70	0.64	0.76	0.63

Between-person correlations were presented above the diagonal, within-person correlations were presented below the diagonal

ICC intra-class correlation, PStress parental daily stress, AdStress adolescent daily stress, Warm parental warmth; PosAff positive affect, Prosocial prosocial behaviors, Emo emotional problems, NegAff = negative affect

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

correlated with adolescent positive affect ($r_b = 0.54$, $r_w = 0.14$, $ps < 0.001$) and prosocial behaviors ($r_b = 0.51$, $r_w = 0.21$, $ps < 0.001$), and negatively with adolescent emotional problems ($r_b = -0.49$, $p < 0.001$; $r_w = -0.08$, $p = 0.024$, respectively) and negative affect ($r_b = -0.38$, $p < 0.001$; $r_w = -0.09$, $p = 0.024$, respectively). At both levels, adolescent positive affect was positively correlated with prosocial behaviors ($r_b = 0.43$, $r_w = 0.17$, $ps < 0.001$), and adolescent emotional problems was positively correlated with negative affect ($r_b = 0.86$, $r_w = 0.50$, $ps < 0.001$). At the within-level, adolescent prosocial behaviors was negatively correlated with negative affect ($r = -0.08$, $p = 0.002$). Lastly, at the between-level, adolescent positive affect was negatively correlated with emotional problems ($r = -0.36$, $p < 0.001$). Intra-class correlations (ICCs) demonstrated that 23% to 37% variances of those constructs were due to within-person fluctuations (Table 1).

Daily Stress, Parental Warmth, and Adolescent Positive Affect

There were significant autoregressive paths of parental warmth ($\beta_s = 0.29$ and 0.30 , $ps < 0.001$ from day $t-1$ to day t , and from day t and day $t+1$, respectively) and positive affect ($\beta = 0.20$, $p < 0.001$). After controlling for the previous day's associations, within the same day, parental daily stress was negatively related to parental warmth ($\beta_s = -0.09$ and -0.08 , $ps = 0.004$ for day t and day $t+1$, respectively). That is, on days when parents experienced higher than their average levels of daily stress, adolescents were also likely to perceive their parents as less warm than their average levels. Nonetheless, adolescent daily stress was not associated with their positive affect within-day ($\beta_s = -0.04$, $ps = 0.149$ and 0.148 for day t and day $t+1$, respectively).

After accounting for the previous day's associations, on days when adolescents perceived that their parents expressed higher than average levels of parental warmth, adolescents were likely to show higher than their average levels of positive affect ($\beta_s = 0.06$, $ps = 0.024$ and 0.023 from day $t-1$ to day t , and from day t and day $t+1$, respectively) on the next day. Furthermore, there was a direct path such that on days when parents reported having higher than their average levels of daily stress, adolescents were also likely to report having higher than average levels of positive affect ($\beta = 0.06$, $p = 0.033$) on the next day. Adolescent positive affect was not associated with the next day's parental warmth ($\beta = -0.01$, $p = 0.848$), and adolescent daily stress was not associated with next day's parental warmth ($\beta = -0.02$, $p = 0.437$). The parent-driven indirect effect where parental daily stress was linked to parental warmth on the same day, which in turn was linked to adolescent positive affect on the next day was marginally significant (-0.03 , 95% CI $[-0.05, 0.001]$, $p = 0.055$). However, the child-driven indirect effect that linked adolescent daily stress to parental warmth on the next day through adolescent positive affect on the same day was not significant (0.001, 95% CI $[-0.01, 0.01]$, $p = 0.848$; Table 2).

Finally, there was a significant within-day residual correlation between parental warmth and positive affect ($r = 0.10$, $p = 0.006$). At the between-level, parental warmth was positively correlated with positive affect ($r = 0.57$, $p < 0.001$; Fig. 2a).

Daily Stress, Parental Warmth, and Adolescent Prosocial Behaviors

Both parental warmth ($\beta_s = 0.28$ and 0.29 , $ps < 0.001$ from day $t-1$ to day t , and from day t and day $t+1$, respectively)

Table 2 Unstandardized model results of daily stress, parental warmth, and adolescent adjustment

	Positive Affect		Prosocial Behaviors		Emotional Problems		Negative Affect	
	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI	<i>b</i>	95% CI
Within level								
PStress (<i>t</i>) -> Warm (<i>t</i>)	-0.35**	[-0.61, -0.09]	-0.35**	[-0.60, -0.09]	-0.34**	[-0.59, -0.09]	-0.32*	[-0.58, -0.06]
Warm (<i>t</i>) -> Warm (<i>t</i> + 1)	0.30***	[0.22, 0.39]	0.29***	[0.20, 0.37]	0.30***	[0.22, 0.39]	0.30***	[0.22, 0.39]
AdAdj (<i>t</i>) -> Warm (<i>t</i> + 1)	-0.004	[-0.05, 0.04]	0.08	[-0.02, 0.19]	0.06	[-0.02, 0.13]	0.02	[-0.02, 0.06]
AdStress (<i>t</i>) -> AdAdj (<i>t</i>)	-0.19	[-0.45, 0.07]	-0.09	[-0.23, 0.04]	0.68***	[0.48, 0.88]	1.25***	[0.93, 1.58]
AdAdj (<i>t</i>) -> AdAdj (<i>t</i> + 1)	0.20***	[0.13, 0.26]	0.22***	[0.14, 0.30]	0.22***	[0.13, 0.31]	0.31***	[0.18, 0.44]
Warm (<i>t</i>) -> AdAdj (<i>t</i> + 1)	0.07*	[0.01, 0.14]	0.06***	[0.03, 0.10]	-0.01	[-0.04, 0.02]	-0.03	[-0.09, 0.03]
PStress (<i>t</i>) -> AdAdj (<i>t</i> + 1)	0.29*	[0.03, 0.55]	0.05	[-0.08, 0.19]	-0.10	[-0.22, 0.03]	-0.24*	[-0.45, -0.03]
AdStress (<i>t</i>) -> Warm (<i>t</i> + 1)	-0.08	[-0.28, 0.12]	-0.07	[-0.27, 0.13]	-0.12	[-0.32, 0.08]	-0.11	[-0.30, 0.07]
Day (<i>t</i>) -> AdAdj (<i>t</i>)	-	-	-	-	-0.002*	[-0.004, 0.000]	-	-
Residual Covariance ^a	0.02**	[0.01, 0.03]	0.02***	[0.01, 0.02]	-0.01	[-0.01, 0.000]	-0.02*	[-0.03, -0.003]
Indirect (<i>P</i>)	-0.03⁺	[-0.05, 0.001]	-0.02*	[-0.04, -0.002]	0.004	[-0.01, 0.02]	0.01	[-0.01, 0.03]
Indirect (<i>A</i>)	0.001	[-0.01, 0.01]	-0.01	[-0.02, 0.01]	0.04	[-0.01, 0.09]	0.03	[-0.02, 0.08]
Between level								
Correlation between random intercepts	0.33***	[0.21, 0.45]	0.12***	[0.07, 0.17]	-0.16***	[-0.24, -0.09]	-0.16***	[-0.24, -0.07]

PStress parental daily stress, *AdStress* adolescent daily stress, *Warm* parental warmth, *AdAdj* adolescent adjustment, *Indirect (P)* indirect effect from parental daily stress to parental warmth to adolescent adjustment, *Indirect (A)* indirect effect from adolescent daily stress to adolescent adjustment to parental warmth. Unstandardized results were presented, significant paths and correlations were bolded. 95% CI was reported as Mplus does not allow bootstrap 95% CI in multilevel modeling

^aResidual correlation between parental warmth and adolescent adjustment within day

⁺ $p = 0.055$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

and prosocial behaviors ($\beta = 0.22$, $p < 0.001$) showed significant stabilities across days. Within the same day, parental daily stress was negatively associated with parental warmth ($\beta_s = -0.09$ and -0.08 , $ps = 0.005$ for day t and day $t + 1$, respectively), but adolescent daily stress was not associated with their prosocial behaviors ($\beta = -0.04$, $p = 0.182$).

Parental warmth was positively associated with adolescent prosocial behaviors on the next day ($\beta = 0.10$, $p = 0.001$), but adolescent prosocial behaviors was not linked to parental warmth on the next day ($\beta_s = 0.05$, $ps = 0.125$ and 0.136 from day $t-1$ to day t , and from day t and day $t + 1$, respectively). The direct link between parental daily stress and next day's prosocial behaviors was not significant ($\beta = 0.02$, $p = 0.459$), neither was the direct link between adolescent daily stress and next day's parental warmth ($\beta = -0.02$, $p = 0.477$). The indirect effect that linked parental daily stress to the same day's parental warmth and subsequently the next day's adolescent prosocial behaviors was significant (-0.02 , 95% CI $[-0.04, -0.002]$, $p = 0.032$). However, the indirect effect that linked adolescent daily stress to the same day's adolescent prosocial behaviors and subsequently the next day's parental warmth was not significant (-0.01 , 95% CI $[-0.02, 0.01]$, $p = 0.305$; Table 2).

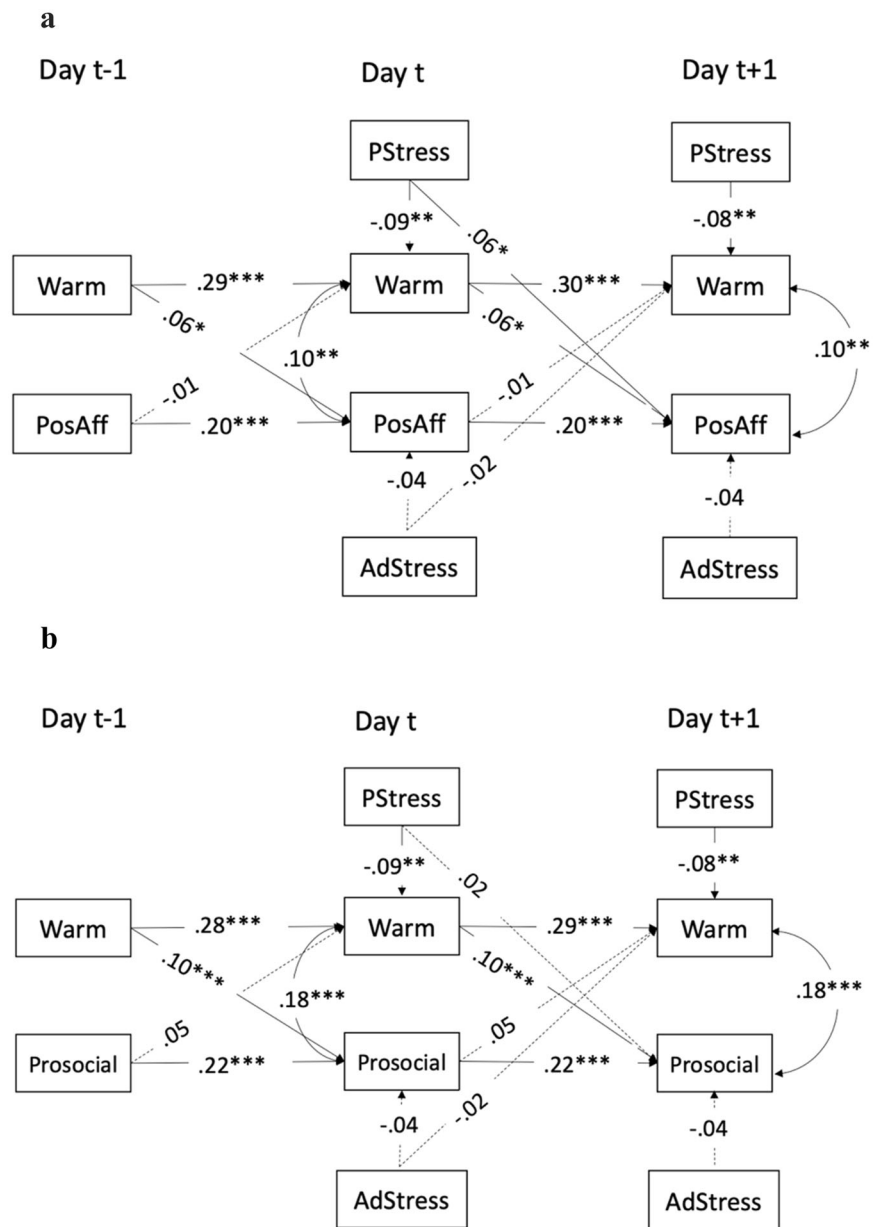
After accounting for the previous day's associations, parental warmth and prosocial behaviors had positive within-day residual correlation ($r = 0.18$, $p < 0.001$). At the between-level, parental warmth was positively correlated with prosocial behaviors ($r = 0.47$, $p < 0.001$; Fig. 2b).

Daily Stress, Parental Warmth, and Adolescent Emotional Problems

Adolescent emotional problems showed a negative linear trend ($\beta = -0.07$, $p = 0.044$). Parental warmth ($\beta_s = 0.29$ and 0.30 , $ps < 0.001$ from day $t-1$ to day t , and from day t and day $t + 1$, respectively) and emotional problems ($\beta = 0.22$, $p < 0.001$) showed significant cross-day stabilities. In addition, parental daily stress was negatively linked with parental warmth on the same day ($\beta = -0.08$, $p = 0.005$), while adolescent daily stress was positively linked with their emotional problems on the same day ($\beta_s = 0.33$ and 0.32 , $ps < 0.001$ for day t and day $t + 1$, respectively).

The cross-day associations between parental warmth and the next day's emotional problems ($\beta = -0.02$, $p = 0.474$), and between emotional problems and the next day's parental warmth ($\beta = 0.03$, $p = 0.122$) were not significant. The direct links between parental daily stress and next day's

Fig. 2 a Daily Associations among Daily Stress, Parental Warmth, and Adolescent Positive Affect. **b** Daily Associations among Daily Stress, Parental Warmth, and Adolescent Prosocial Behaviors. Standardized estimates were presented. Solid lines represented significant estimates, nonsignificant estimates were presented in dashed lines. The same paths across days were constrained to be the same. Linear trend was not included. PStress = parental daily stress; AdStress = adolescent daily stress; Warm = parental warmth; PosAff = positive affect; Prosocial = prosocial behaviors. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$



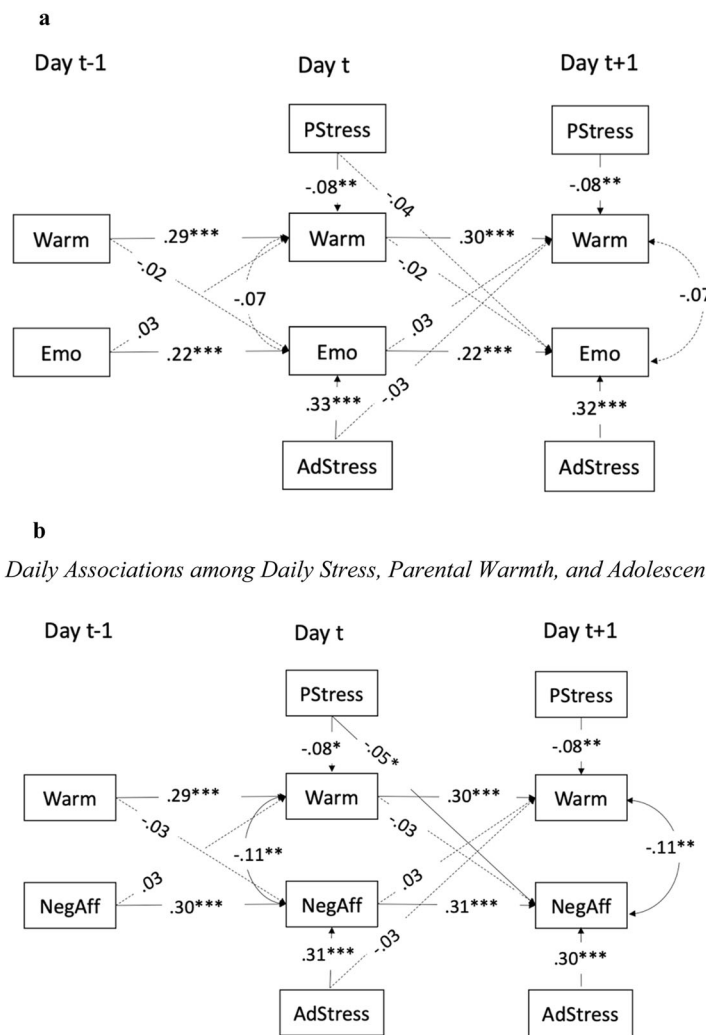
emotional problems ($\beta = -0.04, p = 0.115$), and between adolescent daily stress and next day’s parental warmth ($\beta = -0.03, p = 0.231$) were not significant either. The within-level indirect effect from parental stress to adolescent emotional problems through parental warmth was not significant (0.004, 95% CI $[-0.01, 0.02], p = 0.488$), neither was the indirect effect from adolescent stress to parental warmth through adolescent emotional problems (0.04, 95% CI $[-0.01, 0.09], p = 0.124$; Table 2).

After accounting for previous day’s associations, parental warmth was not correlated with adolescent emotional problems ($r = -0.07, p = 0.060$) within the same day. At the between-level, parental warmth was negatively correlated with adolescent emotional problems ($r = -0.47, p < 0.001$; Fig. 3a).

Daily Stress, Parental Warmth, and Adolescent Negative Affect

There were cross-day stabilities for parental warmth ($\beta_s = 0.29$ and $0.30, ps < 0.001$ from day $t-1$ to day t , and from day t and day $t+1$, respectively) and negative affect ($\beta_s = 0.30$ and $0.31, ps < 0.001$ from day $t-1$ to day t , and from day t and day $t+1$, respectively). Parental daily stress was negatively linked with parental warmth on the same day ($\beta_s = -0.08, ps = 0.011$ and 0.010 for day t and day $t+1$, respectively), and adolescent daily stress was positively linked with their same day negative affect ($\beta_s = 0.31$ and $0.30, ps < 0.001$ for day t and day $t+1$, respectively).

Fig. 3 a Daily Associations among Daily Stress, Parental Warmth, and Adolescent Emotional Problems. **b.** Daily Associations among Daily Stress, Parental Warmth, and Adolescent Negative Affect. Standardized estimates were presented. Solid lines represented significant estimates, nonsignificant estimates were presented in dashed lines. The same paths across days were constrained to be the same. Linear trend was included for emotional problems but was not shown in the graph to ease readability. PStress = parental daily stress; AdStress = adolescent daily stress; Warm = parental warmth; Emo = emotional problems; NegAff = negative affect. * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$



Parental warmth was not associated with the next day’s adolescent negative affect ($\beta = -0.03$, $ps = 0.265$ and 0.270 from day $t-1$ to day t , and from day t and day $t + 1$, respectively), and adolescent negative affect was not associated with the next day’s parental warmth ($\beta s = 0.03$, $ps = 0.273$ and 0.262 from day $t-1$ to day t , and from day t and day $t + 1$, respectively). Parental daily stress was negatively linked to next day’s negative affect ($\beta = -0.05$, $p = 0.018$), but adolescent daily stress was not linked to next day’s parental warmth ($\beta = -0.03$, $p = 0.227$). The within-level indirect effect from parental stress to adolescent negative affect through parental warmth was not significant (0.01 , 95% CI $[-0.01, 0.03]$, $p = 0.351$), neither was the indirect effect from adolescent stress to parental warmth through adolescent negative affect (0.03 , 95% CI $[-0.02, 0.08]$, $p = 0.243$; Table 2).

Parental warmth and adolescent negative affect showed significant within-day residual correlation ($r = -0.11$, $p = 0.009$). At the between level, parental warmth was negatively correlated with negative affect ($r = -0.33$, $p = 0.001$; Table 3; Fig. 3b).

Discussion

Family members’ daily stress influences their behaviors, which could inform their daily well-being and family interactions (Feinberg et al., 2019; Lippold et al., 2016). Using 30-day daily diary data collected from 99 Canadian parent–adolescent dyads, this study examined the daily associations among family members’ daily stress, parental warmth, and several adolescent adjustment outcomes. Partly consistent with the hypothesis, at the daily level, adolescent-perceived parental warmth explained the negative association between parental daily stress and some adolescent adjustment outcomes (i.e., positive affect, prosocial behaviors), but no parallel associations were found with adolescent negative affect and emotional problems. In addition, partly consistent with the hypothesis, adolescent daily stress was positively related to their emotional problems and negative affect within the same day, but not to their positive affect and prosocial behaviors. Contrary to the last hypothesis, adolescent outcomes were not associated with

Table 3 Standardized model results of daily stress, parental warmth, and adolescent adjustment

	Positive Affect		Prosocial Behaviors		Emotional Problems		Negative Affect	
	β	95% CI	β	95% CI	β	95% CI	β	95% CI
Within level								
PStress (t) -> Warm (t)	-0.09/-0.08 ^a	[-0.15, -0.03] / [-0.14, -0.03] ^a	-0.09/-0.08 ^a	[-0.14, -0.03]	-0.08 ^{ab}	[-0.14, -0.03]	-0.08 ^a / -0.08 ^{ab}	[-0.14, -0.02] / [-0.13, -0.02] ^a
Warm (t) -> Warm (t+1)	0.29/0.30 ^{***b}	[0.22, 0.36] / [0.22, 0.38] ^b	0.28/0.29 ^{***b}	[0.21, 0.34] / [0.21, 0.37] ^b	0.29/0.30 ^{***}	[0.23, 0.36] / [0.22, 0.38] ^b	0.29/0.30 ^{***}	[0.23, 0.36] / [0.22, 0.38] ^b
AdAdj (t) -> Warm (t+1)	-0.01	[-0.06, 0.05]	0.05	[-0.01, 0.12] / [-0.02, 0.12] ^b	0.03	[-0.01, 0.08]	0.03	[-0.02, 0.07]
AdStress (t) -> AdAdj (t)	-0.04	[-0.10, 0.02]	-0.04	[-0.10, 0.02]	0.33/0.32 ^{***b}	[0.25, 0.42] / [0.24, 0.41] ^a	0.31/0.30 ^{***a}	[0.24, 0.38] / [0.23, 0.37] ^a
AdAdj (t) -> AdAdj (t+1)	0.20 ^{***}	[0.14, 0.26] / [0.13, 0.26] ^b	0.22 ^{***}	[0.15, 0.30] / [0.14, 0.30] ^b	0.22 ^{***}	[0.13, 0.31]	0.30/0.31 ^{***a}	[0.19, 0.40] / [0.18, 0.43] ^b
Warm (t) -> AdAdj (t+1)	0.06*	[0.01, 0.11]	0.10 ^{***}	[0.04, 0.15] / [0.04, 0.16] ^b	-0.02	[-0.07, 0.03] / [-0.08, 0.04]	-0.03	[-0.08, 0.02]
PStress (t) -> AdAdj (t+1)	0.06*	[0.004, 0.11]	0.02	[-0.03, 0.07]	-0.04	[-0.09, 0.01]	-0.05*	[-0.10, -0.01]
AdStress (t) -> Warm (t+1)	-0.02	[-0.08, 0.03]	-0.02	[-0.08, 0.04]	-0.03	[-0.09, 0.02]	-0.03	[-0.08, 0.02]
Day (t) -> AdAdj (t)	-	-	-	-	-0.07*	[-0.13, -0.002]	-	-
Residual Correlation ^c	0.10 ^{**}	[0.03, 0.17]	0.18 ^{***}	[0.10, 0.25]	-0.07	[-0.15, 0.003]	-0.11 ^{**}	[-0.19, -0.03]
Between level								
Correlation between random intercepts	0.57 ^{***}	[0.42, 0.73]	0.47 ^{***}	[0.29, 0.65]	-0.47 ^{***}	[-0.67, -0.27]	-0.33 ^{***}	[-0.52, -0.14]

Standardized results were presented, significant paths and correlations were bolded. Conventional product-of-coefficients 95% CI was reported because Mplus does not allow bootstrap 95% CI in multilevel modeling. The complete standardized estimates of the same path across days may differ with marginal differences (i.e., by 0.01) as these estimates depend on the observed variances of the variables, which may vary across days given the available data and the creation of lagged variables (day 1 will automatically have missing values for their lagged variables)

PStress parental daily stress, AdStress adolescent daily stress, Warm parental warmth, AdAdj adolescent adjustment

^aEstimates within day t were presented first, estimates within day t + 1 were presented after the slash

^bEstimates from day t - 1 to day t were presented, estimates from day t to day t + 1 were presented after the slash

^cResidual correlation between parental warmth and adolescent adjustment within day

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

parental warmth on the next day, and no child-driven indirect effect was found.

Parental Daily Stress, Parental Warmth, and Adolescent Adjustment at the Daily Level

The most important and innovative finding of this study was the sequential, cross-day associations among parental daily stress, parental warmth, and certain adolescent adjustment outcomes. To start with, on days when parents reported experiencing more daily stress, they were also likely to be perceived by their adolescents as being less warm. Consistent with existing studies (Malinen et al., 2017; Nelson et al., 2017), this finding demonstrates the within-day spillover effect of stressful experiences from different domains to parent–adolescent interactions. Subsequently, the cross-day associations indicated a parent-driven effect from previous day's parental warmth to next day's adolescent positive affect and prosocial behaviors. Although adolescence has been conventionally viewed as the stage during which parental effect is waning, these parent-driven effects demonstrate the salient role and continuing relevance of parental socialization in adolescence (Hill et al., 2007; Pinquart, 2017), and the current findings extend this argument into the daily context of parent–adolescent interactions.

Unexpectedly, parental warmth was not associated with adolescents' maladaptive outcomes (i.e., emotional problems and negative affect). There are two speculative explanations. First, the temporal effect from parental warmth to adolescent maladjustment likely manifests on a different timescale. In fact, after controlling for previous day's associations, parental warmth and adolescent negative affect had a significant and negative within-day correlation ($r = -0.11$), consistent with a recent study where Wang et al. (2021) reported a within-day, rather than cross-day link between parental support and adolescent negative affect. Others have suggested that the effect of positive parenting on adolescent maladjustment may be observed on a more concurrent (i.e., hours; Bülow et al., 2022) or long-term (i.e., years; Boele et al., 2022) timescale. Specifically, parental warmth was negatively related to adolescent negative affect three hours later (Bülow et al., 2022), whereas parental support was negatively linked to adolescent depressive symptoms two years later, and no association was found at the daily, weekly, monthly, or annually level (Boele et al., 2022). To fully answer whether and how parenting behaviors impact adolescent maladjustment, future studies may utilize ecological momentary assessment and measurement burst designs to capture these associations at different timescales.

Second, relative to parental warmth, the restrictive and harsh parenting behaviors may be more relevant in the development of adolescent maladjustment. Daily diary research has documented both within- and cross-day links between restrictive parenting (e.g., negative parent–child

interaction, psychological control) and child or adolescent maladjustment (e.g., health problems, negative emotions; Aunola et al., 2013; Lippold et al., 2016; Xu & Zheng, 2022). With the bursting needs for autonomy development, adolescents may question parental authority and desire an egalitarian, rather than hierarchical, parent–adolescent relationship (Smetana & Rote, 2019). When parents behave in a controlling and intrusive way, adolescents likely experience high levels of pressures and frustration, which may eventually lead to maladaptive outcomes.

Finally, parental daily stress hindered next day's adolescent positive affect and prosocial behaviors by interrupting parental warmth of the previous day. Only two studies so far have investigated the mediating role of family interactions in the associations between daily stress and child outcomes on the daily level (Chung et al., 2009; Schmidt et al., 2021), whereas both studies examined these associations within, as opposed to, across days. This study complements and extends their findings by further demonstrating that parental daily stress could impede their nurturing parenting behaviors in the immediate context, which in turn, have both concurrent (indicated by within-day residual correlation) and subsequent (indicated by cross-lagged paths) effects on adolescent well-being. Noteworthy, after accounting for the effect of parental warmth, parental daily stress was not directly linked to adolescent prosocial behaviors on the next day, indicating parental warmth may fully explain some cross-day links between parental warmth and adolescent adaptive outcomes. The positive and direct association between parental stress and next day's adolescent positive affect was nonetheless counterintuitive. Similarly, although there was no cross-day link between parental warmth and adolescent negative affect, parental daily stress was negatively linked to adolescent negative affect on the next day. Speculatively, although daily stress may have immediate effect in deteriorating parental warmth, on more stressful days, parents may also use more adaptive coping strategies to facilitate a supportive family environment and to fulfill their parenting duties, which may promote certain adolescent desirable experiences (i.e., positive affect) and suppress some maladjustment outcomes (i.e., negative affect) on the following day.

Adolescent Daily Stress, Adolescent Adjustment, and Parental Warmth at the Daily Level

Despite the parent-driven effects, there were no parallel associations in the child-driven processes among adolescent daily stress, adolescent adjustment, and parental warmth. Consistent with the limited existing literature (Lippold et al., 2016; White & Shih, 2012; Zheng et al., 2022), adolescents reported more emotional problems and negative affect on days with more daily stress. However, a similar

association was not found between adolescent daily stress and adaptive outcomes (i.e., positive affect, prosocial behaviors). Although parental daily stress and parental warmth were measured via different reporters (i.e., parent-reported daily stress and adolescent-reported parental warmth), adolescent daily stress and their emotional and behavioral outcomes were measured through adolescent-reports only. Potentially, when adolescents see themselves as experiencing more stress, they likely hold a negative attribution to themselves and their surroundings (Lee et al., 2019), and this negative attribution may have a more prominent role in adolescents' perception of their problematic, relative to adaptive, adjustment. Alternatively, daily stress was assessed as a unified construct, but recent research has suggested that different stressors (e.g., marital stress, home environment stress, work stress) may show different relations with family functioning and individual well-being (Nelson et al., 2017; Zheng et al., 2022). Relatedly, the measures of daily stress (e.g., had emotional worries, was lonely) overlapped with some of the measures of emotional problems and negative affect, which may explain the relatively stable associations between adolescent daily stress and maladaptive (vs. adaptive) outcomes. Future studies that unfold the associations between stressors from different domains and different aspects of family interactions are desired.

Unlike the parent-driven effect, there was no expected cross-day link from adolescent adjustment to parental warmth. This unexpected finding may be due to the different contexts within which adolescents assess parenting and their own behaviors. Adolescents may evaluate themselves' psychological well-being and behaviors across different interpersonal contexts (e.g., parent–adolescent relationships, teacher–student relationships, peer relationships; Harter et al., 1998) and settings (e.g., leisure activities, schools, neighborhoods), but they may form their perception of parental warmth exclusively during parent–adolescent interactions. Therefore, adolescents who experience higher levels of positive affect may not necessarily perceive their parents as being warmer, as they may attribute their positive feelings to activities outside the family (e.g., positive interactions with friends, get a good grade at school). Similarly, adolescents who experience more emotional difficulties may not view their parents as less warm given their negative feelings could be related to events that do not involve their parents.

Moreover, given adolescents' overall decreasing time at home and increasing activities unsupervised by the parents, parents have little knowledge about adolescents' daily feelings and experiences without adolescents' voluntary disclosure (Smetana & Rote, 2019). At the daily level, parents may not be able to respond promptly to their adolescents' behaviors and emotions, which could explain the

absence of child-driven effect. Interestingly, adolescents' voluntary disclosure demonstrated daily variations, and adolescents tended to disclose more to their mothers on days with better parent–adolescent relationships and higher parental responsiveness (Villarreal & Nelson, 2022). Hence, adolescent disclosure and parental solicitation likely matter in the daily mechanisms of parent–adolescent interactions and family processes, which need to be incorporated into future research of daily family dynamics.

Lastly, although the findings partly support the parent-driven family stress processes in daily lives, there was no evidence of any child-driven effect. Adolescents' enriched social contexts, their decreasing time at home, and limited parental knowledge regarding adolescents' daily activities may explain these non-significant findings. Further, although correlation does not inform directionality, after accounting for previous day's effects, there was a within-day link between adolescent daily stress and negative affect, as well as between adolescent negative affect and parental warmth (as indicated by the residual correlation). Thus, the child-driven effect may happen on a smaller timescale (e.g., within-day) compared with the parent-driven effect that may carry over days. In other words, child-driven effects possibly tend to be more immediate whereas parent-driven effects tend to be more lasting. Additionally, only one specific parenting dimension (i.e., parental warmth) and a limited number of adolescent adjustment outcomes were measured. The child-driven effect may be more prominent in other aspects of family interactions (e.g., disciplinary parenting, parent–adolescent conflict). Replications with other parenting behaviors and adolescent adjustment outcomes are needed to fully understand the role of adolescents in impacting daily family stress processes.

Associations between Parental Warmth and Adolescent Adjustment at the Between Level

At the between-level aggregated across 30 days, relative to adolescents whose parents showed lower levels of warmth, parents with higher levels of warmth were also likely to have adolescents with higher positive affect, more prosocial behaviors, fewer emotional problems, and lower negative affect. Although causal associations cannot be inferred, these associations are consistent with the broader parenting literature that supports that nurturant parenting is positively related to adolescent adaptive outcomes, whereas negatively to adolescent maladaptive outcomes (Hoeve et al., 2009; Pinquart, 2017; Yan et al., 2021). Importantly, the between-level correlations do not always agree with the within-level associations (e.g., parental warmth and emotional problems), indicating the varying family dynamics at different time scales, and demonstrating the complex nature of family interactions at the daily and the aggregated levels.

Strengths and Limitations

Using month-long daily diary dyadic data, this study provides novel evidence regarding the cross-day family stress processes between parental and adolescent daily stress, parenting behavior, and multiple adolescent adjustment outcomes. Notably, through incorporating parent-reported daily stress, adolescent-reported parental warmth and adolescent adjustment, and using MLSEMs that disentangle between-person differences from within-person fluctuations, the findings revealed a robust parent-driven indirect effect that links parental daily stress to adolescent adjustment through parental warmth across days. More importantly, this study represents the initial efforts to examine both parent- and child-driven effects in daily family stress processes, which have not been investigated in previous research. Altogether, the current study contributes important knowledge of the daily mechanisms among parental and adolescent daily stress, family dynamics, and adolescent well-being, and unveils the transmitting nature from individuals' daily stress to other family members' functioning in the daily contexts.

Several limitations should be noted and addressed in future research. First, although parental daily stress was measured by parent reports, parental warmth and adolescent adjustment were captured through adolescent reports only. Parent–adolescent show discrepancies in their perceptions of the same behavior, which may have different implications to adolescent well-being and parenting behaviors (Korelitz & Garber, 2016; Xu & Zheng, 2022). A multi-informant approach that reflects and integrates different perceptions is desired in future research. Second, due to the relatively small sample size and the complex model specification (e.g., constrained paths, residual variances and covariances within and across days), random slopes that reflect between-person differences in within-level associations were not estimated (Janssen et al., 2021; Keijsers et al., 2022). Relatedly, only the hypothesized associations between parental warmth and a few adolescent adjustment outcomes were examined, whose mechanisms cannot be generalized to other parenting behaviors and adolescent functioning. In addition, some evidence has suggested that mothers are more susceptible to parental stressors (e.g., parental psychopathology; Connell & Goodman, 2002) in parenting than fathers, and gender differences have been found in adolescents' emotion expression (Chaplin & Aldao, 2013). Nonetheless, given the small numbers of participating fathers, the current study was not able to examine the gender differences in the associations between individual stress, parenting behaviors, and adolescents functioning at the daily level. Studies with larger samples and various measures of parenting and adolescent outcomes are needed to understand the heterogeneity of these daily processes across different parent–adolescent dyads and across families. Third, the COVID-19 pandemic has caused extra burden on both parents

and adolescents, but it also provides a window to understand family dynamics under ongoing global major stressors (Schmidt et al., 2021). One future direction could be examining whether and how such major stressors may alter family stress processes in daily lives.

Conclusion

Parental and adolescent daily stress, family interactions, and individual well-being vary on a daily basis. At the daily level, parenting practices and adolescent adjustment are informed by parental and adolescent daily stress respectively; parental daily stress may further exert short-term effect hindering adolescent positive development by interrupting nurturant parenting behaviors. Extant literature has shown the diminishing parental effects during adolescence. The current study nevertheless demonstrates parents' prominent role in constructing family interactions and subsequently shaping adolescent developmental processes, whose impact may surpass the child-driven effect, at least in the spillover process from parental daily stress to family lives on the micro daily timescale. To promote better family interactions and to achieve optimal adolescent development, parents and adolescents may benefit from practices and trainings that enhance their adaptive coping strategies to buffer the negative effect of daily stress on individual well-being and family interactions, and to foster a cohesive and supportive familial environment.

Acknowledgements The authors gratefully acknowledge all the participants, Elk island and St. Albert public schools, and our research assistants.

Authors' Contributions J.X. contributed to the study design, performed the statistical analysis, interpreted the data, and drafted the manuscript; Y.Z. designed the study, contributed to statistical analysis and results interpretation, and revised the manuscript critically. Both authors read and approved the final version of this manuscript.

Funding This research was supported partly with funding from the Social Sciences and Humanities Research Council (IDG 430-2018-00317 and 409-2020-00080) and Natural Sciences and Engineering Research Council (RGPIN-2020-04458 and DGEGR-2020-00077) of Canada.

Data Sharing and 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.

Conflicts of Interest The authors declare no conflict of interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Appendix A: Daily Stress Items

Parent-reported Items	Adolescent-reported Items
PQ1: Too many things to do	TQ1: Too many things to do
PQ2: Had too many social obligations	TQ2: Had too many social obligations
PQ3: Was unorganized	TQ3: Was unorganized
PQ4: Concerned about health in general	TQ4: Was lonely
PQ5: Had problems with your children	TQ5: Worried about your physical appearance
PQ6: Had troublesome neighbors	TQ6: Wasted time
PQ7: Job dissatisfaction	TQ7: Forgot something
PQ8: Had your sleep disturbed	TQ8: Was misunderstood
PQ9: Overloaded with family responsibilities	TQ9: Had your sleep disturbed
PQ10: Was forced to socialize	TQ10: Hurried to meet a deadline
PQ11: Had trouble relaxing	TQ11: Had trouble making decisions
PQ12: Unexpected expenses	TQ12: Had difficulty with friends
PQ13: Had problems with aging parents	TQ13: Had emotional worries
	TQ14: Performed poorly at a task
	TQ15: Interrupted during task/activity
	TQ16: Did something you did not want to do
	TQ17: Did not get enough rest
	TQ18: Heard some bad news
	TQ19: Not enough time for entertainment and recreation, hobbies or activities

References

- Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, 14(2), 64–68. <https://doi.org/10.1111/j.0963-7214.2005.00336.x>.
- Almeida, D. M., Wethington, E., & Chandler, A. L. (1999). Daily transmission of tensions between marital dyads and parent-child dyads. *Journal of Marriage and Family*, 61(1), 49–61. <https://doi.org/10.2307/353882>.
- Artemis, G., & Touloumakos, A. K. (2016). “They accept me, they accept me not”: Psychometric properties of the Greek version of the Child Parental Acceptance-Rejection Questionnaire-Short Form. *Journal of Family Issues*, 37(9), 1226–1243. <https://doi.org/10.1177/0192513X14543851>.
- Aunola, K., Tolvanen, A., Viljaranta, J., & Nurmi, J. E. (2013). Psychological control in daily parent-child interactions increases children’s negative emotions. *Journal of Family Psychology*, 27(3), 453–462. <https://doi.org/10.1037/a0032891>.
- Bai, S., Reynolds, B. M., Robles, T. F., & Repetti, R. L. (2017). Daily links between school problems and youth perceptions of interactions with parents: A diary study of school-to-home spillover. *Social Development*, 26(4), 813–830. <https://doi.org/10.1111/sode.12229>.
- Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, 55(1), 83–96. <https://doi.org/10.2307/1129836>.
- Boele, S., Denissen, J., Moopen, N., & Keijsers, L. (2020). Over-time fluctuations in parenting and adolescent adaptation within families: A systematic review. *Adolescent Research Review*, 5(3), 317–339. <https://doi.org/10.1007/s40894-019-00127-9>.
- Boele, S., Nelemans, S. A., Denissen, J., Prinzie, P., Bülow, A., & Keijsers, L. (2022). Testing transactional processes between parental support and adolescent depressive symptoms: From a daily to a biennial timescale. *Development and Psychopathology*, 1–15. <https://doi.org/10.1017/S0954579422000360>.
- Bolger, N., DeLongis, A., Kessler, R. C., & Wethington, E. (1989). The contagion of stress across multiple roles. *Journal of Marriage and Family*, 51(1), 175–183. <https://doi.org/10.2307/352378>.
- Brenning, K., Mabbe, E., & Soenens, B. (2022). Work-family conflict and toddler parenting: A dynamic approach to the role of parents’ daily work-family experiences in their day-to-day parenting practices through feelings of parental emotional exhaustion. *Community, Work, and Family*. <https://doi.org/10.1080/13668803.2022.2037517>.
- Bülow, A., van Roekel, E., Boele, S., Denissen, J. J. A., & Keijsers, L. (2022). Parent-adolescent interaction quality and adolescent affect—An experience sampling study on effect heterogeneity. *Child Development*. <https://doi.org/10.1111/cdev.13733>.
- Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology*, 48, 243–267. <https://doi.org/10.1146/annurev.psych.48.1.243>.
- Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: A meta-analytic review. *Psychological Bulletin*, 139(4), 735–765. <https://doi.org/10.1037/a0030737>.
- Chung, G. H., Flook, L., & Fuligni, A. J. (2009). Daily family conflict and emotional distress among adolescents from Latin American, Asian, and European backgrounds. *Developmental Psychology*, 45(5), 1406–1415. <https://doi.org/10.1037/a0014163>.
- Connell, A. M., & Goodman, S. H. (2002). The association between psychopathology in fathers versus mothers and children’s internalizing and externalizing behavior problems: A meta-analysis. *Psychological Bulletin*, 128(5), 746–773. <https://doi.org/10.1037/0033-2909.128.5.746>.
- Crosby Budinger, M., Drazdowski, T. K., & Ginsburg, G. S. (2013). Anxiety-promoting parenting behaviors: a comparison of anxious parents with and without social anxiety disorder. *Child Psychiatry and Human Development*, 44(3), 412–418. <https://doi.org/10.1007/s10578-012-0335-9>.
- DeLongis, A., Coyne, J. C., Dakof, G., Folkman, S., & Lazarus, R. S. (1982). Relationship of daily hassles, uplifts, and major life events to health status. *Health Psychology*, 1(2), 119–136. <https://doi.org/10.1037/0278-6133.1.2.119>.

- Feinberg, M. E., Jones, D. E., McDaniel, B. T., Liu, S., & Almeida, D. (2019). New fathers' and mothers' daily stressors and resources influence parent adjustment and family relationships. *Monographs of the Society for Research in Child Development*, 84(1), 18–34. <https://doi.org/10.1111/mono.12404>.
- Fosco, G. M., Brinberg, M., & Ram, N. (2021). Day-to-day changes in parent–adolescent connectedness: Relations with daily subjective well-being and eudaimonia differ for parents and adolescents. *The Journal of Positive Psychology*, 16(5), 640–650. <https://doi.org/10.1080/17439760.2020.1791945>.
- Fosco, G. M., & Lydon-Staley, D. M. (2020). Implications of family cohesion and conflict for adolescent mood and well-being: Examining within- and between- family processes on a daily timescale. *Family Process*, 59(4), 1672–1689. <https://doi.org/10.1111/famp.12515>.
- Geldhof, G. J., Preacher, K. J., & Zyphur, M. J. (2014). Reliability estimation in a multilevel confirmatory factor analysis framework. *Psychological Methods*, 19, 72–91. <https://doi.org/10.1037/a0032138>.
- Goodman, R., Meltzer, H., & Bailey, V. (1998). The Strengths and Difficulties Questionnaire: A pilot study on the validity of the self-report version. *European Child and Adolescent Psychiatry*, 7(3), 125–130. <https://doi.org/10.1007/s007870050057>.
- Harter, S., Waters, P., & Whitesell, N. R. (1998). Relational self-worth: Differences in perceived worth as a person across interpersonal contexts among adolescents. *Child Development*, 69(3), 756–766. <https://doi.org/10.2307/1132202>.
- Hill, N. E., Bromell, L., Tyson, D. F., & Flint, R. (2007). Developmental commentary: Ecological perspectives on parental influences during adolescence. *Journal of Clinical Child and Adolescent Psychology*, 36(3), 367–377. <https://doi.org/10.1080/15374410701444322>.
- Hoeve, M., Dubas, J. S., Eichelsheim, V. I., van der Laan, P. H., Smeenk, W., & Gerris, J. R. (2009). The relationship between parenting and delinquency: A meta-analysis. *Journal of Abnormal Child Psychology*, 37(6), 749–775. <https://doi.org/10.1007/s10802-009-9310-8>.
- Janssen, L. H. C., Elzinga, B. M., Verkuil, B., Hillegers, M. H. J., & Keijsers, L. (2021). The link between parental support and adolescent negative mood in daily life: Between-person heterogeneity in within-person processes. *Journal of Youth and Adolescence*, 50(2), 271–285. <https://doi.org/10.1007/s10964-020-01323-w>.
- Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, 4(1), 1–39. <https://doi.org/10.1007/BF00844845>.
- Keijsers, L. (2016). Parental monitoring and adolescent problem behaviors: How much do we really know? *International Journal of Behavioral Development*, 40, 271–281. <https://doi.org/10.1177/0165025415592515>.
- Keijsers, L., Bülow, A., & Boele, S. (2022). Measuring parent–adolescent interactions in natural habitats. The potential, status, and challenges of ecological momentary assessment. *Current Opinion in Psychology*, 44, 264–269. <https://doi.org/10.1016/j.copsyc.2021.10.002>.
- Korelitz, K. E., & Garber, J. (2016). Congruence of parents' and children's perceptions of parenting: A meta-analysis. *Journal of Youth and Adolescence*, 45(10), 1973–1995. <https://doi.org/10.1007/s10964-016-0524-0>.
- Laporte, N., Soenens, B., Flamant, N., Vansteenkiste, M., Mabbe, E., & Brenning, K. (2022). The role of daily need crafting in daily fluctuations in adolescents' need-based and affective experiences. *Motivation and Emotion*, 46, 137–149. <https://doi.org/10.1007/s11031-021-09921-2>.
- Laurenceau, J. P., & Bolger, N. (2005). Using diary methods to study marital and family processes. *Journal of Family Psychology*, 19(1), 86–97. <https://doi.org/10.1037/0893-3200.19.1.86>.
- Lee, B., Kaya, C., Chen, X., Wu, J.-R., Iwanaga, K., Umucu, E., Bezyak, J., Tansey, T. N., & Chan, F. (2019). The buffering effect of character strengths on depression: The intermediary role of perceived stress and negative attributional style. *European Journal of Health Psychology*, 26(3), 101–109. <https://doi.org/10.1027/2512-8442/a000036>.
- Lippold, M. A., McHale, S. M., Davis, K. D., Almeida, D. M., & King, R. B. (2016). Experiences with parents and youth physical health symptoms and cortisol: A daily diary investigation. *Journal of Research on Adolescence*, 26(2), 226–240. <https://doi.org/10.1111/jora.12186>.
- LoBraico, E. J., Brinberg, M., Ram, N., & Fosco, G. M. (2020). Exploring processes in day-to-day parent–adolescent conflict and angry mood: Evidence for circular causality. *Family Process*, 59(4), 1706–1721. <https://doi.org/10.1111/famp.12506>.
- Lovejoy, M. C., Graczyk, P. A., O'Hare, E., & Neuman, G. (2000). Maternal depression and parenting behavior: a meta-analytic review. *Clinical Psychology Review*, 20(5), 561–592. [https://doi.org/10.1016/s0272-7358\(98\)00100-7](https://doi.org/10.1016/s0272-7358(98)00100-7).
- Malinen, K., Rönkä, A., Sevón, E., & Schoebi, D. (2017). The difficulty of being a professional, a parent, and a spouse on the same day: Daily spillover of workplace interactions on parenting, and the role of spousal support. *Journal of Prevention and Intervention in the Community*, 45(3), 156–167. <https://doi.org/10.1080/10852352.2016.1198121>.
- Masarik, A. S., & Conger, R. D. (2017). Stress and child development: A review of the Family Stress Model. *Current Opinion in Psychology*, 13(1), 85–90. <https://doi.org/10.1016/j.copsyc.2016.05.008>.
- Mastrotheodoros, S., Van Lissa, C. J., Van der Graaff, J., Deković, M., Meeus, W. H. J., & Branje, S. J. T. (2020). Day-to-day spillover and long-term transmission of inter-parental conflict to adolescent–mother conflict: The role of mood. *Journal of Family Psychology*, 34(8), 893–904. <https://doi.org/10.1037/fam0000649>.
- McCabe, J. E. (2014). Maternal personality and psychopathology as determinants of parenting behavior: A quantitative integration of two parenting literatures. *Psychological Bulletin*, 140(3), 722–750. <https://doi.org/10.1037/a0034835>.
- Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus users' guide* (8th ed.). Muthén & Muthén.
- Nelson, J. A., Boyer, B. P., Villarreal, D. L., & Smith, O. A. (2017). Relations between mothers' daily work, home, and relationship stress with characteristics of mother–child conflict interactions. *Journal of Family Psychology*, 31(4), 431–441. <https://doi.org/10.1037/fam0000276>.
- Paschall, K. W., & Mastergeorge, A. M. (2016). A review of 25 years of research in bidirectionality in parent–child relationships: An examination of methodological approaches. *International Journal of Behavioral Development*, 40(5), 442–451. <https://doi.org/10.1177/0165025415607379>.
- Pinquart, M. (2017). Associations of parenting dimensions and styles with internalizing symptoms in children and adolescents: A meta-analysis. *Marriage and Family Review*, 53(7), 613–640. <https://doi.org/10.1080/01494929.2016.1247761>.
- Quach, A. S., Epstein, N. B., Riley, P. J., Falconier, M. K., & Fang, X. (2015). Effects of parental warmth and academic pressure on anxiety and depression symptoms in Chinese adolescents. *Journal of Child and Family Studies*, 24(1), 106–116. <https://doi.org/10.1007/s10826-013-9818-y>.
- Schmidt, A., Kramer, A. C., Brose, A., Schmiedek, F., & Neubauer, A. B. (2021). Distance learning, parent–child interactions, and affective well-being of parents and children during the COVID-19 pandemic:

- A daily diary study. *Developmental Psychology*, 57(10), 1719–1734. <https://doi.org/10.1037/dev0001232>.
- Smetana, J. G., & Rote, W. M. (2019). Adolescent–parent relationships: Progress, processes, and prospects. *Annual Review of Developmental Psychology*, 1, 41–68. <https://doi.org/10.1146/annurev-devpsych-121318-084903>.
- Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the Positive and Negative Affect Schedule (PANAS). *Journal of Cross-Cultural Psychology*, 38(2), 227–242. <https://doi.org/10.1177/0022022106297301>.
- van der Kaap-Deeder, J., Vansteenkiste, M., Soenens, B., & Mabbe, E. (2017). Children’s daily well-being: The role of mothers’, teachers’, and siblings’ autonomy support and psychological control. *Developmental Psychology*, 53(2), 237–251. <https://doi.org/10.1037/dev0000218>.
- Villarreal, D. L., & Nelson, J. A. (2022). Communicating and connecting: Associations between daily adolescent disclosure and mother–adolescent responsiveness. *Journal of Research on Adolescence*, 32(2), 704–710. <https://doi.org/10.1111/jora.12676>.
- Wang, M. T., Toro, J. D., Scanlon, C. L., Schall, J. D., Zhang, A. L., Belmont, A. M., Voltin, S. E., & Plevniak, K. A. (2021). The roles of stress, coping, and parental support in adolescent psychological well-being in the context of COVID-19: A daily-diary study. *Journal of Affective Disorders*, 294(1), 245–253. <https://doi.org/10.1016/j.jad.2021.06.082>.
- White, M. E., & Shih, J. H. (2012). A daily diary study of co-rumination, stressful life events, and depressed mood in late adolescents. *Journal of Clinical Child and Adolescent Psychology*, 41(5), 598–610. <https://doi.org/10.1080/15374416.2012.706518>.
- Xu, J., & Zheng, Y. (2022). Links between shared and unique perspectives of parental psychological control and adolescent emotional problems: A dyadic daily diary study. *Child Development*. <https://doi.org/10.1111/cdev.13789>.
- Yan, N., Ansari, A., & Peng, P. (2021). Reconsidering the relation between parental functioning and child externalizing behaviors: A meta-analysis on child-driven effects. *Journal of Family Psychology*, 35(2), 225–235. <https://doi.org/10.1037/fam0000805>.
- Zheng, H., Cooke, E. M., Li, K., & Zheng, Y. (2022). Capturing hassles and uplifts in adolescents’ daily lives: Links with physical and mental well-being. *Journal of Youth and Adolescence*. <https://doi.org/10.1007/s10964-022-01682-6>.

Publisher’s note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

Jingyi Xu is a postdoctoral fellow in the Department of Psychology at the University of Alberta. Her research interests include the associations between different parenting behaviors and children’s and adolescents’ socioemotional development in various cultural contexts.

Yao Zheng is an Assistant Professor in the Department of Psychology at the University of Alberta. His research interests include the development and prevention of child and adolescent physical and mental health problems at different timescales (e.g., days, years), especially intensive longitudinal data.