

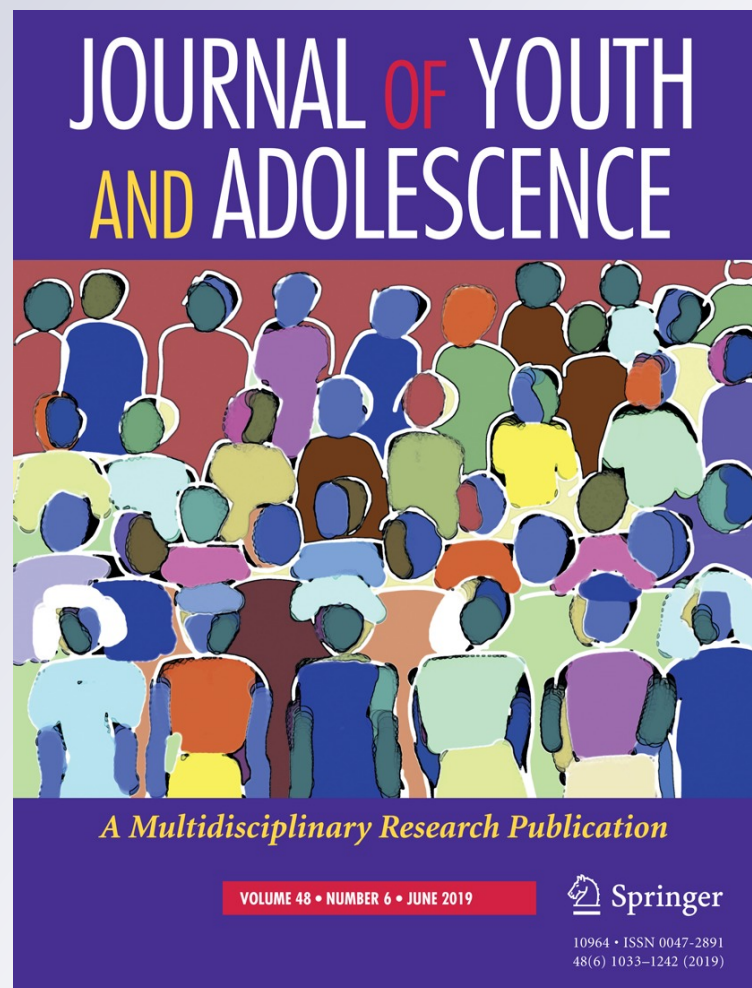
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Emotional Coregulation in Mexican-Origin Parent–Adolescent Dyads: Associations with Adolescent Mental Health

Evelyn Mercado¹ · Joanna Kim² · Nancy A. Gonzales³ · Andrew J. Fuligni^{4,5}

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Abstract

Research on the health benefits and consequences of close relationships has suggested the linkage in daily emotions (i.e., coregulation) between close partners is an important relationship dynamic. While the coupling of daily emotions among family members (parent–child and marital dyads) has been widely documented, research examining emotional coregulation among ethnic minority youth during adolescence, a period marked by heightened emotion and risk for psychopathology, remains an important area in need of exploration. This study examined correlates of emotional coregulation in a sample of Mexican-origin adolescents ($M_{\text{age}} = 15.02$, $SD = .83$) and their parents ($M_{\text{age}} = 41.93$, $SD = 6.70$). Dyads reported on daily levels of distress and happiness for 14 consecutive days across two waves of data collection a year apart ($n_{\text{wave1}} = 428$ dyads, $n_{\text{wave2}} = 336$ dyads). Dyads who reported getting along were more likely to coregulate their daily happiness. Importantly, coregulation of distress was only present in older adolescents who reported above average levels of internalizing symptoms. The results suggest coregulation of distress may shape or be shaped by poor mental health during the later years of adolescence, a time when youth may be establishing a degree of emotional autonomy from parents.

Keywords Emotional coregulation · Synchrony · Parent–adolescent relationship · Internalizing symptoms

Introduction

Family relationships are characterized by permeable boundaries between partners that facilitate cohesion and emotional connectedness (Cox and Paley 2003). The ease by which emotions flow from one close partner to the next, referred to as emotional coregulation (Butler and Randall 2013), has been linked to adaptive self-regulation in children (Feldman 2003) and to a lesser extent in

adolescence (Larson and Richards 1994). Adolescence is a transitional period characterized by elevated levels of internalizing problems (Kessler et al. 2012) and increased sensitivity to the social environment (Steinberg and Morris 2001). Emotional coregulation between parents and adolescents may be associated with youth mental health, with the parent–adolescent relationship having the potential to protect against or to exacerbate the development of adolescent psychopathology (e.g., DeKlyen and Greenberg 2008). To date, a single prospective study found behavioral processes similar to coregulation (e.g., mutually responsive and synchronized behavioral interactions) during early childhood were linked to adolescent psychological adjustment (Feldman 2010). However, concurrent associations between emotional coregulation and psychological adjustment during the adolescent years remains unexplored.

Family processes occur against the backdrop of existing cultural norms that shape the interpretation and evaluation of social interactions, with family relationships being the central carriers of culture specific goals (Campos and Kim 2017). For one, Latin American culture places a strong emphasis on family relationships, a cultural value referred to as *familism*. Familism emphasizes warm, close, and supportive family ties, promoting positive emotional

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expressivity in order to facilitate cohesion (Campos et al. 2014; Fuligni et al. 1999). Given the central tenets of Latin American culture, examining associations between mental health and interpersonal emotion dynamics (e.g., coregulation) would highlight emotional coregulation as an important family process for understanding optimal psychological adjustment in Latinx youth. To date, a cultural lens has yet to be applied to the study of emotional coregulation among family members. The current study builds on prior work by examining coregulation of daily mood, the impact of family and cultural values in facilitating coregulation, and associations between coregulation and internalizing symptoms in a sample of Mexican American families.

Defining Emotional Coregulation

Relationships serve as inputs and outputs for emotion regulation, such that a child's emotion regulation develops within the context of close relationships and these skills continue to serve an important role in the development of future close ties (Bell and Calkins 2000). Close dyadic partners (e.g., parents and children, romantic partners) help individuals process emotional content, and emotions can be transmitted and reciprocated between partners culminating in a state of coregulation (Butler 2011; Larson and Richards 1994). Emotional coregulation refers to an interpersonal emotion dynamic that encompasses covariation of emotional channels (e.g., daily mood, physiology; Butler 2011) between close partners, whereby partners may exhibit a (directional or non-directional) pattern of emotional similarity across varying time scales (e.g., moment-to-moment transmission, day-to-day similarity). The present paper uses emotional coregulation to refer to correspondence in day-to-day changes in positive and negative mood between parents and adolescents. Because emotions play an important role in everyday lives and influence behaviors and physiology that contribute to health outcomes, examining emotional coregulation may help us to better understand how close relationships affect health.

The family is a central source of emotional experiences across the lifespan. Closeness and cohesion within the family system may be maintained, in part, through the strong associations between family members' daily affect. This interpersonal emotion dynamic has been extensively examined during early development. The matching of optimal affective states between infants and caregivers lay down the foundation for successful self-regulatory capabilities, a finding that has been supported in longitudinal studies (e.g., Feldman et al. 1999). Parent and adolescent affect have been found to influence each other proximally, day-to-day, and across years (Larson and Richards 1994; Mancini et al. 2016; Kim et al. 2001).

Whereas the documentation of coregulation within family relationships has been prolific, the question of

whether coregulation is an indicator of relationship quality and associated with health outcomes remains inconclusive. The literature on coregulation is fragmented, highlighting both negative relationship processes, such as the presence of interpersonal conflict, and supportive relationship processes as drivers of coregulation (Butler 2011). Continuing to examine how both positive and negative relationship processes (e.g., conflict and support) contribute to coregulation across emotional indices remains an important future direction. Likewise, given the association between social relationships and health, examining whether coregulation is related to poor mental health outcomes—particularly during the adolescent period, a time characterized by greater vulnerability to psychopathology—remains an important area of research (Avenevoli et al. 2015; Kessler et al. 2005).

Parent–Child Relationships During Adolescence and Mental Health

Adolescence is characterized by biological, behavioral, and emotional changes that increase the sensitivity to social relationships in the environment (Sumter et al. 2010). The parent–child bond undergoes a transformation during this period as parent–child interactions become less hierarchical and more reciprocal and adolescents' reliance on peer relationships increases (Chu and Powers 1995; Fuligni and Eccles 1993). As adolescents attempt to renegotiate family roles to gain behavioral and emotional autonomy, the potential for transient conflict and dissatisfaction within the parent–adolescent relationship increases (Smetana et al. 2006; Steinberg 2001). Despite increases in adolescent autonomy, the parent–adolescent relationship continues to function as a context for the ongoing development of emotion regulation, suggesting parenting quality continues to play a vital role in the psychological adjustment of adolescents (Collins and Steinberg 2006). For instance, positive parent–child bonds have been linked to declines in adolescent risk for difficulties (Jakobsen et al. 2012; Zahn-Waxler et al. 2000) and adaptive parenting behaviors such as parental warmth protect against depression and anxiety symptoms in adolescence (Gray and Steinberg 1999). Additionally, parental support and not friend support has been found to buffer the link between depressive symptoms and biological markers of health (e.g., cortisol, inflammation) during adolescence (Guan et al. 2016). Despite established links between adolescents' sensitivity to parent behaviors and health, further research on aspects of the parent–child relationship that may be related to adolescent mental health, such as coregulation, are warranted.

Synchronous and mutually responsive parent–child interactions and day-to-day synchrony of positive emotions have been associated with greater self-esteem, prosocial behavior, and emotional competence (Lee et al. 2017;

Lindsey et al. 2008). However, research has also found parent–child reciprocity of negative affect over time, with parent–adolescent dyads who report spending more time together also exhibiting a stronger association in levels of negative affect and stress physiology (Kim et al. 2001; Papp et al. 2009; Saxbe et al. 2014). That is, as a parent or adolescent reported experiencing negative affect, their partner reported a reciprocal increase in their own negative affect. What remains unknown is whether this relationship dynamic is associated with adolescent internalizing symptoms, (e.g., depressed mood, anxiety, social withdrawal), which may be particularly susceptible to adolescent's sensitivity and awareness of their parents' psychological state, a focus of the current study. Coregulation of positive mood is expected to be negatively related to internalizing symptoms whereas coregulation of negative daily mood will be positively associated with internalizing symptoms.

Cultural Emphasis on Family Interdependence

Emotional coregulation may be adaptive and necessary in the context of a family environment that values family cohesion and solidarity. Similarly, cohesive family contexts may promote an association in family members' daily affect. Families of Mexican-origin emphasize family interdependence, frequent face-to-face contact, and strong family support (Campos et al. 2014; Fuligni et al. 1999; Suárez-Orosco and Suárez-Orosco 1995). Family interdependence is promoted by turning to family members as a source of primary emotional and behavioral support, as well as placing the family over the self, behaviors described by the cultural construct of familism (Campos et al. 2014). Familism promotes higher family obligation, which has been related to adolescent reports of closer relationships with parents and siblings, and reduced parent–child conflict (Kuhlberg et al. 2010). Familism values have also been linked to greater psychological health, both directly (Telzer et al. 2015), and indirectly through the effect of familism on relationship factors such as closeness and support (Campos et al. 2014; Rodriguez et al. 2007).

Given the psychological benefits of family processes associated with familism, examining how both family obligation values, and relationship behaviors related to those values (e.g., family assistance, family support, conflict), shape relationship dynamics like emotional coregulation, is an important next step in the literature. Emotional coregulation of happiness and distress was hypothesized to vary as a function of family obligation values, daily family assistance, and parent–adolescent support and conflict. To further test associations between family functioning and coregulation, associations between coregulation and the adolescent's generational status were also tested as a potential proxy for acculturative stress.

Following the acculturation gap-distress model, coregulation was also expected to differ by adolescent's generational status, with youth who identified as second generation (their parent was born in Mexico and they were born in the U.S.) displaying a different pattern of coregulation given the potential for intergenerational discrepancies in cultural values (i.e., acculturation gaps) to negatively impact family functioning (Szapocznik and Kurtines 1993; Telzer 2010).

Current Study

The current study utilized daily diary checklists to examine whether parent and adolescent mood was associated on a daily basis in a sample of Mexican-origin parent–adolescent dyads. It was hypothesized that emotional coregulation of happiness and distress would be observed at the daily level. That is, both daily levels of distress and daily levels of happiness would be associated between parents and adolescents, with changes in one partner's level of affect leading to similar changes in the other partner.

Coregulation of daily mood was also expected to differ by adolescent age and gender, with younger adolescents and females showing the strongest associations in daily mood. Past literature highlights increased levels of emotional autonomy in older adolescents which may affect covariation of daily emotions between parent and child (Steinberg and Silverberg 1986). However, coregulation may also vary by gender given that daughters have been found to be more sensitive to behaviors and affect exhibited by other family members (Saxbe et al. 2014) and are more likely to display supportive family behaviors (Telzer et al. 2015) that may facilitate coregulation. Associations between daily and family characteristics and coregulation were also examined, with the expectation that on days adolescents spent more time with parents, reported getting along, and provided greater family assistance, there would be stronger emotional coregulation. In addition, global family characteristics like support and conflict were also expected to be associated with coregulation, with dyads who report low conflict and greater parent–child support exhibiting greater coregulation of happiness. Adolescents who exhibit a stronger sense of familism were also expected to exhibit greater linkage of daily mood with their parent given the emphasis Mexican culture places on family interdependence. Following the acculturation gap-distress model, coregulation was also expected to differ by adolescent's generational status (Szapocznik and Kurtines 1993).

Importantly, links between emotional coregulation and adolescent internalizing symptoms were examined in the present study. Past research suggests coregulation is correlated with positive psychological adjustment during

childhood, a finding this study will explore during adolescence and extend by examining positive and negative mood. Coregulation of negative mood (distress) was expected to be positively associated with adolescent internalizing symptoms while coregulation of positive mood (happiness) would be negatively associated with adolescent internalizing symptoms.

Methods

Participants

Families of Mexican descent were recruited for a 2-year longitudinal study of family relationships and daily experiences. Adolescents ($N = 428$; 50.2% female) from 9th and 10th grade ($M_{\text{age}} = 15.02$, $SD = .83$) participated in the first wave of the study with the adult who self-identified as the adolescent's primary caregiver. A total of 337 dyads from the first wave (79% of participants) were retained for a second wave of data collection when adolescents were in the 10th and 11th grade ($M_{\text{age}} = 16.00$, $SD = 1.19$). The second wave occurred on average a year ($SD = .23$) after the first wave assessment.

The majority of primary caregivers ($M_{\text{age}} = 41.93$, $SD = 6.74$) self-identified as the adolescent's mother (82.7%) with the remainder being the father (13.1%), and other family relatives (4%; e.g., grandparents, aunts or uncles). Most participants belonged to immigrant families, with 12.6% of adolescents being of the first generation (i.e., adolescent and parents were born in Mexico), 68.9% of the second generation (i.e., adolescent born in U.S., and at least one parent born in Mexico), and 18.5% of the third generation or greater (i.e., both parent and adolescent born in U.S.). The median annual household income was \$32,000. The majority of the parents reported completing at most some high school education at the first wave of the study (66.7% less than a high school degree, 7.6% high school degree only, 5.5% trade or vocational school, and 18.8% at least some college). The average family had more than one child and adolescent participants reported an average of 1.76 siblings ($SD = 1.18$).

Procedure

Mexican-heritage families with 9th and 10th grade adolescents were recruited from two public high schools in the greater Los Angeles area. Classrooms within the two high schools were randomly selected from official school rosters each week for the research team to make in-class presentations, mail study information, and phone families regarding the research study. A total of 428 families agreed to participate, representing 63% of families who were

reached by phone and determined eligible for the study if the parent reported a Mexican background.

A study interviewer visited the home of participants where the primary caregiver and adolescent provided consent and assent. To capture demographic information, family relationship and climate, and measures of adolescent internalizing symptoms, caregivers participated in a personal interview and the adolescent independently completed a self-report questionnaire. All interviewers were bilingual in English and Spanish and administered the interview in whichever language the parent preferred: 71% of caregivers elected to complete the interview in Spanish, whereas 98.4% of adolescents completed the questionnaire in English. Interviewers were non-student professionals that were trained to obtain consent and assent, conduct the interview, and provide daily diary instructions according to the study protocol.

Following the interview and self-report questionnaire, both adolescent and caregiver participants were provided with fourteen days of diary checklists to complete every night before going to bed for two subsequent weeks. Parents and adolescents were instructed to independently complete the daily checklists on the same days. The three-page checklists took approximately five to ten minutes to complete each night. Participants were instructed to fold and seal each completed diary checklist each night and to stamp the seal with an electronic time stamper that imprinted the current date and time on each checklist. At the end of the 2-week period, interviewers returned to the home to collect the checklists. Adolescents received \$30 and their primary caregiver received \$50 for study participation. An additional movie pass was given to participants for study compliance (e.g., completing checklists on time). Compliance was high; 96% of diaries were completed by parents and adolescents, and 90% and 86% of diaries were completed on time (i.e., before noon the following day) by parents and adolescents, respectively. The participants were invited to participate in a second wave of data collection using the same study procedures the following year. All study procedures were approved by the University Institutional Review Board.

Measures

Daily mood

Parents and adolescents completed an adapted version of the Profile of Mood States each night for 14 days at both Wave 1 and Wave 2 (POMS; questionnaire; Lorr and McNair 1971). Participants were asked how much they experienced each mood on a Likert scale of 1 (not at all) to 5 (extremely). An average score was created across mood items grouped along two dimensions: Happiness (joyful,

happy, calm) and Distress (sadness, hopeless, discouraged, on edge, unable to concentrate, uneasy, and nervous) in accordance with previous publications (e.g., Espinoza et al. 2013). The measure of happiness had acceptable reliability for both adolescents (Range: $\alpha_{\text{Wave1}} = .68-.75$, $\alpha_{\text{Wave2}} = .68-.76$) and parents (range: $\alpha_{\text{Wave1}} = .65-.77$, $\alpha_{\text{Wave2}} = .66-.77$) at the daily level. The measure of distress also had strong reliability for both adolescents (Range: $\alpha_{\text{Wave1}} = .76-.87$, $\alpha_{\text{Wave2}} = .83-.87$) and parents (range: $\alpha_{\text{Wave1}} = .85-.91$, $\alpha_{\text{Wave2}} = .89-.93$).

School day

Within each diary checklist, the adolescent answered Yes or No to the question, “Is this a school day?”

Daily family relationship

Adolescents’ Yes/No responses to the daily diary question of whether they “got along with [their] parents” was used as both a daily-level predictor and averaged across 14 days for use as a wave-level (level 2) measure of a positive family relationship. Similarly, adolescents’ Yes/No responses to if they “spent leisure time with [their] family” was used as a daily and wave-level predictor. Both items predicted daily mood and depressive symptomatology in previous research (Telzer and Fuligni 2013).

Parental assistance

Adolescents reported on their daily level of assistance to their parents within the 14-day checklist period every night before bed (see Tsai et al. 2016). They answered “Yes” or “No” to having engaged in the following four assistance behaviors daily: helping parents with official business, helping parents with work, helping translate for parents, providing parents with emotional support. The four items were summed within a day to create a daily assistance measure, daily assistance was then averaged across the 14 days within a wave to create a wave-level measure of parental assistance.

Parental support

Both parents and adolescents indicated how often they perceived parents to understand and support the adolescent on a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always) in the past month (Armsden and Greenberg 1987). Sample items include “[Parents] respected [adolescents’] feelings”, “[Parents] helped [adolescents] talk about problems. Statements were modified for parent and adolescent report. Responses to the 9 items were averaged to create a parental support index per informant.

The scale had a good internal consistency for both adolescents (Wave 1: $\alpha = .94$; Wave 2: $\alpha = .94$) and parents (Wave 1 $\alpha = .82$; Wave 2: $\alpha = .83$).

Parent–adolescent conflict

Both parents and adolescents reported on the overall experience of conflict between them and their parents within the past month at each wave (Ruiz et al. 1998). Using a 5-point Likert-type scale ranging from 1 (almost never) to 5 (almost always), parents and adolescents responded to 10 items on how often they “yelled or raised voices at each other,” “disagreed,” and other measures of conflict. The mean of the 10 items was used as the family conflict index for each participant. The scale had a good internal consistency for both adolescents (Wave 1: $\alpha = .86$; Wave 2: $\alpha = .89$) and parents (Wave 1: $\alpha = .87$; Wave 2: $\alpha = .87$).

Family obligation values

Adolescents completed the Family Obligation Scale (Fuligni et al. 1999), which tapped into three different aspects of family obligation: *current assistance* (12 items), *respect for family* (7 items), *future support* (6 items). For current assistance, adolescents reported how often they themselves felt they should be assisting the family with household tasks (e.g., “run errands that your family needs done”) or spend time with their family (e.g., “spend time with your family on the weekends”) on a 5-point Likert-type scale (1 = Almost never, 5 = Almost always). For respect for family, adolescents reported on their beliefs about the importance of respecting and following the wishes of family members (e.g., “follow your parents’ advice about what to do after high school”) also using a 5-point scale (1 = Not important at all, 5 = Very important). Future support assessed adolescents’ beliefs about their obligations to support and be near their families in the future on the same 5-point scale of importance (e.g., “help your parents financially in the future”). Each of the subscales had good internal consistency at each timepoint (Current assistance: Wave 1: $\alpha = .82$; Wave 2: $\alpha = .84$; Respect: Wave 1: $\alpha = .85$; Wave 2: $\alpha = .84$; Future support: Wave 1: $\alpha = .77$; Wave 2: $\alpha = .76$).

Adolescents’ internalizing symptoms

Adolescents completed the Youth Self-Report (Achenbach and Rescorla 2001) at both waves. Adolescents rated 31 items tapping into anxious, somatic, and withdrawn symptoms (e.g., “I worry a lot,” “I cry a lot”) on a three-point scale (0 = not true of me, 1 = somewhat true of me, 2 = often true of me). An internalizing symptoms score was computed

by summing across the anxious, withdrawn, and somatic subscales. The scale had a good internal consistency (Wave 1: $\alpha = .88$; Wave 2: $\alpha = .87$).

Analytic Strategy

Multilevel modeling (MLM) using PROC Mixed in SAS version 9 (SAS Institute, Inc., Cary, NC) was employed to examine the following research questions: (1) does coregulation of distress and happiness occur in parent–adolescent dyads?; (2) does coregulation differ by gender and age?; (3) do characteristics of the day and family predict coregulation?; and (4) is coregulation associated with adolescent mental health? Given the nested nature of the data (14 days of daily diary reports at two data collection time points nested within parent–adolescent dyads) a series of three-level, two intercept models were conducted, a data analytic approach suitable for dyadic data (Laurenceau and Bolger 2005; Raudenbush et al. 1995). All models specified an autoregressive error structure to control for day-to-day correlations in daily mood reports and include adolescent age and gender as additional covariates. To test these dyadic models, the data was structured with input data files consisting of parents' and adolescents' data on separate lines nested within a family level ID. Following the Actor-Partner Interdependence Model (APIM), each partner was represented twice in the dataset, once as an actor in their own line of data and again as a partner in their family member's line of data, forming what is known as a pairwise dataset. The structure of the dataset allowed for the calculation of separate intercept terms for parents and adolescents through the use of dummy codes at level-1 as represented in the equations below as “parent” and “adolescent”, a modeling technique common to dyadic analysis referred to as “dual intercept” or “two intercept” models (Laurenceau and Bolger 2005; Raudenbush et al. 1995). The NOINT option in SAS was used to suppress the traditional intercept and force the computation of two intercepts, one for each partner. All time-varying predictors were person mean centered and all level-2 predictors (e.g., family characteristics) were grand-mean centered at each wave.

In the level-1 equation below, Y_{twd} represents the slope of distress or happiness of dyad d for wave w on day t . The coefficients for b_{0wd} and b_{1wd} represent the average mood for parent and adolescent for wave w in dyad d , and b_{2wd} represents the relationship between an individual's mood on a given day and their partner's person-mean centered mood on the same day, after partialing out the intercept (i.e., the strength of coregulation between parent and adolescent). At level-2, the slopes and intercepts from level-1 are treated as outcome variables and modeled as a function of the family predictors of interest (i.e., daily family relationships, parental assistance, parent support, family conflict, family

obligation, and adolescent internalizing symptoms). As an example, “ParentAssist” abbreviated for average daily parental assistance, is included in the Level-2 equations below. The regression coefficient π_{21} estimates the degree to which the relationship between adolescent and parent daily mood (b_{2iw}) varies as a function of adolescent reported parental assistance (ParentAssist). The final level of equations (level-3) aggregates over dyads and allows for the incorporation of dyad-level variables, in the current model adolescent gender and generational status were entered at level-3 to examine whether coregulation varied as a function of the adolescent's gender or generational status.

Level-1: Time (day)

$$Y_{twd} = b_{0wd} \text{Parent}_{wd} + b_{1wd} \text{Adolescent}_{wd} + b_{2wd} \text{Partner}_{wd} + e_{twd}$$

Level-2: Wave

$$b_{0wd} = \pi_{00d} + \pi_{01} \text{ParentAssist}_d + u_{0wd};$$

$$b_{1wd} = \pi_{10d} + \pi_{11} \text{ParentAssist}_d + u_{1wd};$$

$$b_{2iw} = \pi_{20d} + \pi_{21} \text{ParentAssist}_d + u_{2wd}.$$

Level-3: Dyad

$$\pi_{00d} = \gamma_{000} + \gamma_{010} \text{Gender} + v_{00d};$$

$$\pi_{10d} = \gamma_{100} + \gamma_{110} \text{Gender} + v_{10d};$$

$$\pi_{20d} = \gamma_{200} + \gamma_{210} \text{Gender} + v_{20d}.$$

Results

Means and Correlations

Average levels of daily happiness did not differ between wave 1 ($M = 3.29$, $SD = 1.04$) and wave 2 ($M = 3.27$, $SD = 1.02$) for adolescents, $t(329) = .90$, $p = .37$. Parents also did not exhibit differences in average levels of happiness from wave 1 ($M = 3.06$, $SD = .71$) to wave 2 ($M = 3.02$, $SD = .70$), $t(326) = .90$, $p = .37$. Mean levels of distress did not differ between wave 1 ($M = 1.52$, $SD = .57$) and wave 2 ($M = 1.51$, $SD = .57$) for adolescents, $t(329) = .45$, $p = .65$. Similar to adolescents, parent's average level of daily distress did not differ between wave 1 ($M = 1.58$, $SD = .69$) and wave 2 ($M = 1.55$, $SD = .64$), $t(323) = .95$, $p = .34$. Bivariate correlations examined adolescent and parent mean level associations within waves (see Table 1). Parent and adolescent mean levels of daily happiness were significantly correlated at wave 1 ($r = .14$, $p < .01$) and wave 2 ($r = .12$, $p < .05$). Mean levels of distress were correlated between parent and adolescent at wave 1 ($r = .24$, $p < .001$) but not at wave 2 ($r = .03$, $p = .55$).

Coregulation of Distress and Happiness

First, using a three-level model (days within waves nested within dyads) coregulation was examined across mood states by modeling associations between partner's distress

Table 1 Bivariate correlations among continuous variables of interest

	1	2	3	4	5	6	7	8	9	10	11	12
1. Mean daily happiness (A)	–	–.05	.12*	.02	.29***	.04	–.18**	–.02	.18**	.22***	.13*	–.20***
2. Mean daily distress (A)	–.09	–	–.01	.03	–.23***	–.05	.18**	.03	–.17**	–.18***	–.09	.38***
3. Mean daily happiness (P)	.14**	–.001	–	–.32***	.07	.22***	.04	–.03	.11†	.18**	.07	–.03
4. Mean daily distress (P)	.01	.24***	.003	–	–.01	–.21***	.03	.13*	.03	–.08	.04	.03
5. Parent support (A)	.30***	–.26***	.02	–.08	–	.12*	–.30***	–.09	.31***	.48***	.35***	–.42***
6. Parent support (P)	.14**	–.08†	.16*	–.13**	.28***	–	–.14*	–.28***	.06	.09	.05	–.01
7. Conflict (A)	–.07	.24**	.04	.08	–.33***	–.10*	–	.33***	–.03	–.19**	–.16**	.30***
8. Conflict (P)	–.09†	.14**	–.03	.13**	–.18***	–.14**	.28***	–	–.03	–.07	–.10	.04
9. Current assistance (A)	.27***	–.02	.06	–.003	.40**	.13**	–.02	–.04	–	.44***	.47***	–.10†
10. Respect for family (A)	.27***	–.17**	.08	–.02	.47***	.26***	–.19***	–.19***	.51***	–	.60***	–.30***
11. Future support (A)	.21***	–.01	.11*	.05	.33***	.11*	.01	–.11	.49***	.60***	–	–.18**
12. Internalizing symptoms (A)	–.20***	.41***	–.05	.10*	–.39***	–.15**	.36***	.16**	–.14**	–.23***	–.12*	–

Wave 1 is displayed below the diagonal

Wave 2 is displayed above the diagonal

A adolescent-report, P parent-report

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

and happiness and an individual's own mood at the daily level (research question 1; see Table 2). For distress, the fixed effects portion of the model indicated that parents and adolescents' same-day levels of distress were unrelated. That is, there was no significant association between partner's deviations in distress levels above or below their mean and an individual's own change in distress levels ($b = 0.01$, $p = .25$; see Table 2 Column 1). For daily happiness, the fixed coefficient for partner mood was significant ($b = 0.05$, $p < .001$), indicating parents and adolescents' same-day levels of happiness were related (see Table 1 Column 5). Specifically, on a given day, changes in happiness above or below a partner's mean level were associated with similar changes above or below an individual's own average happiness.

In addition to the fixed effects portion of the model, the random effects model was examined to determine whether there was significant variability in coregulation between families. For the distress model, the variance of the partner slope was significant, supporting the presence of between-family variability in coregulation of daily distress ($b = .02$, $p < .001$). The random covariance estimate between adolescent and parent intercepts was also significant, suggesting adolescents with higher average distress levels were more likely to be paired with parents who also had higher average distress levels ($b = .06$, $p < .001$). For happiness, the random effects model yielded similar results, with the significant random variance coefficient for partner mood ($b = 0.02$, $p < .001$) indicating the presence of between-family variability in coregulation of daily happiness. A significant random covariance of adolescent and parent intercepts suggested parents with greater levels of happiness were more likely to be paired with adolescents who also had higher daily levels of happiness ($b = 0.06$, $p < .001$).

Moderating Role of Age and Gender

Building on the previous three-level model (days within waves nested within dyads) the role of adolescent's age and gender in coregulation of distress and happiness was examined through the inclusion of age and the interaction between age and partner mood as predictors. For the distress model, daily reports of distress varied by gender, with adolescent girls exhibiting higher distress levels relative to adolescent boys ($b = 0.15$, $p < .01$). Parent's distress levels, however, did not differ by adolescent gender. Neither gender nor age predicted coregulation of distress, as shown by the non-significant Gender*Partner Mood and Age*-Partner Mood interaction coefficients for distress (see Table 2, Column 3). For happiness, daily levels did not vary by adolescent gender and there was no interaction between gender and partner mood. Age was related to daily happiness; increases in adolescent age were significantly

Table 2 Parent–adolescent dyads exhibit significant associations in daily happiness but not distress

	Distress coregulation				Happiness coregulation			
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
<i>Fixed Effects</i>								
Adolescent intercept	1.52***	0.02	1.83***	0.17	3.28***	0.04	3.89***	0.04
Parent intercept	1.56***	0.02	1.87***	0.17	3.03***	0.03	3.65***	0.05
Partner mood	0.01	0.01	−0.08	0.17	0.05***	0.01	−0.10	0.16
Adolescent age			−0.02	0.01			−0.04***	0.01
Adolescent gender ^a			−0.10**	0.04			0.01	0.05
Age partner mood*			0.005	0.01			0.01	0.01
Gender partner mood*			0.01	0.02			−0.03	0.02
<i>Random Effects</i>								
Adolescent intercept variance	0.21***	0.02	0.21***	0.02	0.46***	0.04	0.45***	0.04
Parent intercept variance	0.30***	0.02	0.31***	0.03	0.37***	0.03	0.36***	0.03
Intercept covariance	0.06***	0.01	0.05***	0.02	0.06***	0.02	0.07**	0.02
Partner variance	0.02***	0.002	0.02***	0.003	0.02***	0.003	0.02***	0.003

Fixed effects estimate the intercept and slopes of interest across families

Random effects test the variance of the intercept and slope between families

^aAdolescent gender was coded as 0 = male, 1 = female* $p < .05$; ** $p < .01$; *** $p < .001$

associated with a .04 unit decrease in happiness (see Table 1, Column 7). Adolescent age was not associated with coregulation of happiness, as shown by the non-significant partner happiness*age interaction.

Moderating Role of Daily and Family Characteristics

Daily variables (school day, leisure time spent together, and adolescent report of getting along with parents) were entered into the three-level model as level-1 predictors of coregulation. There was no significant association between school day and coregulation of distress ($b = .01$, $p = .75$) or coregulation of happiness ($b = -0.02$, $p = .31$). At the daily-level, leisure time spent together did not moderate the association between parent and adolescent daily distress ($b = .02$, $p = .16$) or happiness ($b = .01$, $p = .44$). At the daily-level, whether adolescents reported getting along with their parents on a given day did not predict coregulation of distress ($b = -0.02$, $p = .35$) or coregulation of daily happiness ($b = -0.01$, $p = .75$). However, when examining average levels of getting along at the wave-level, there was a significant association with coregulation for daily happiness. Parent–adolescent dyads who reported a greater proportion of days in which they got along, had a stronger positive association of their daily happiness ($b = .08$, $p < .001$; see Fig. 1).

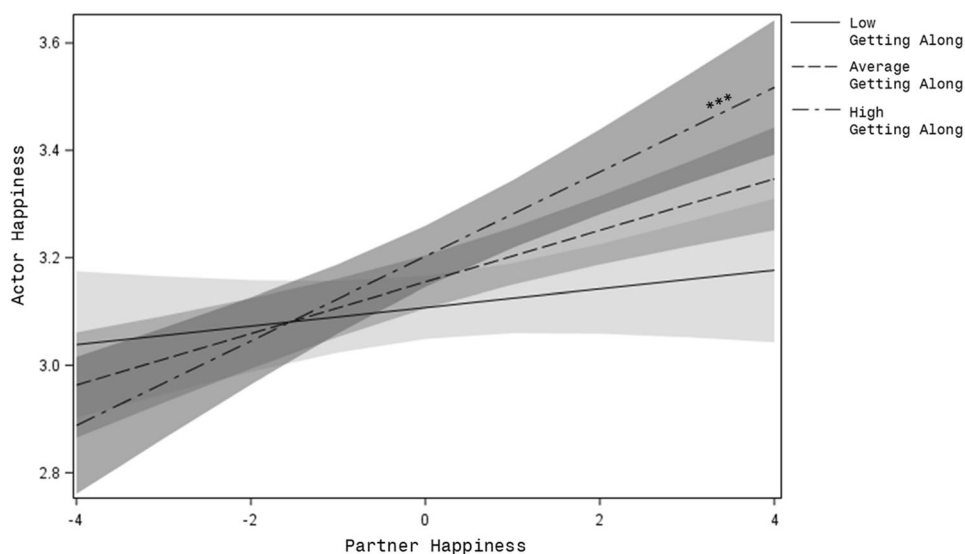
Parental assistance behaviors, parental support, adolescent–parent conflict, and familism values (youth's current family support, family respect, and future family support) were entered as level-2 predictors of coregulation for both distress and happiness separately. Parental

assistance behaviors reported by adolescents were not associated with coregulation of distress ($b = -0.02$, $p = .47$) or happiness ($b = -0.02$, $p = .30$). Adolescent report of parental support did not predict coregulation of distress ($b = -0.001$, $p = .91$) nor happiness ($b = -0.01$, $p = .45$). Similarly, adolescent's report of family conflict in the home was not a significant predictor of coregulation for distress ($b = .01$, $p = .39$) or happiness ($b = .006$, $p = .61$). Adolescent's familism values were not associated with coregulation of distress (current family support: $b = .01$, $p = .42$, family respect: $b = -0.003$, $p = .79$, future family support: $b = -0.01$, $p = .27$) or happiness (current family support: $b = .006$, $p = .69$, family respect: $b = .02$, $p = .16$, future family support: $b = -0.004$, $p = .72$). Adolescent's generational status was also not related to coregulation of distress, with no difference in coregulation between the first and second generation ($b = .01$, $p = .81$), the first and third generation ($b = -0.04$, $p = .28$), or the second and third generation ($b = .05$, $p = .07$). Adolescent generational status was related to coregulation of happiness, with a significantly different pattern of coregulation emerging between first generation youth and second generation youth ($b = .10$, $p = .003$), and no difference in coregulation between first and third generation youth ($b = .06$, $p = .11$) or second and third generation youth ($b = -0.03$, $p = .22$).

Moderating Role of Adolescent Internalizing Symptoms

To test whether adolescent's self-reported internalizing symptoms were related to coregulation of distress and

Fig. 1 Coregulation of daily happiness varies by how much parent–adolescent dyads reported getting along. Parent–adolescent dyads who report a greater proportion of days where they got along (dash dotted line indicates 1 SD above the mean) had a stronger association in their daily happiness than dyads who reported a smaller proportion of days in which they got along (solid line indicates 1 SD below the mean; dashed line indicates mean level of getting along). The figure was made in SAS version 9 (SAS Institute, Inc.) using PROC PLM effect plot and PROC SGPLOT functions



happiness, internalizing symptoms was examined as a moderator in two three-level models, one for distress and one for happiness. Internalizing symptoms were not associated with coregulation of distress ($b = .001$, $p = .57$), or happiness ($b = .0004$, $p = .70$). Given the longitudinal design of the study, the current study examined whether the association between internalizing symptoms and coregulation was stable across time or differed by age. This was done by including a three-way interaction, partner mood*internalizing*age, into the three-level model. The three-way interaction, partner distress*internalizing symptom*age was significant ($b = .003$, $p < .01$); further probing the interaction revealed that among older adolescents, a significant association between internalizing symptoms and coregulation of distress emerges. At 17 years of age, adolescents who report the highest levels of internalizing symptoms (a standard deviation above the mean) exhibit coregulation of distress (see Fig. 2). In contrast, internalizing symptoms were not associated with coregulation of distress among younger adolescents. Age did not moderate the association between internalizing symptoms and coregulation of happiness ($b = -.002$, $p = .08$).

Alternative Analyses

To test the robustness of the present findings, alternative complementary analyses were conducted to examine differences in coregulation within each wave and explore associations between coregulation and internalizing symptoms across waves (i.e., does wave 1 coregulation predict wave 2 internalizing symptoms). First, multilevel models were tested within each wave and suggest similar results. Parent and adolescent change in daily distress levels is significantly related at wave 1 ($b = .03$, $p < .01$), but unrelated at wave 2. Similar to the bivariate correlations of

average levels reported in the descriptives, daily levels of happiness were significantly related between parent and adolescent at both wave 1 ($b = .06$, $p < .001$) and wave 2 ($b = .06$, $p < .001$).

To examine whether coregulation predicts future internalizing symptoms, Level-2 residual files were saved from the multilevel models to extract empirical Bayesian (EB) estimates of the Level-1 coregulation coefficient (partner mood predicting actor mood); an EB estimate was extracted for both wave 1 and wave 2. Bivariate correlations were then examined between EB estimates and adolescent internalizing symptoms at each wave, only coregulation of distress at wave 2 was significantly correlated with adolescent internalizing symptoms at wave 2, $r(336) = .13$, $p < .05$. Correlations were also tested within a multiple regression framework in order to control for adolescent age and adolescent gender. Wave 1 coregulation of distress (EB estimate) was not related to Wave 1 internalizing symptoms ($\beta = -.02$, $p = .70$) or Wave 2 internalizing symptoms ($\beta = -.02$, $p = .68$). Again, only wave 2 coregulation of distress was significantly related to wave 2 internalizing symptoms ($\beta = .12$, $p < .05$). Together these alternative analyses support the three-level models reported in the results, and suggest overall associations between parent and adolescent happiness, but not for distress at both waves. The findings also highlight later adolescence as a period of increased parental influence on mental health outcomes, specifically internalizing symptoms, which have been reported to increase across the adolescent period.

Discussion

Despite the popular notion that adolescence is characterized by an increased orientation away from parents, ongoing

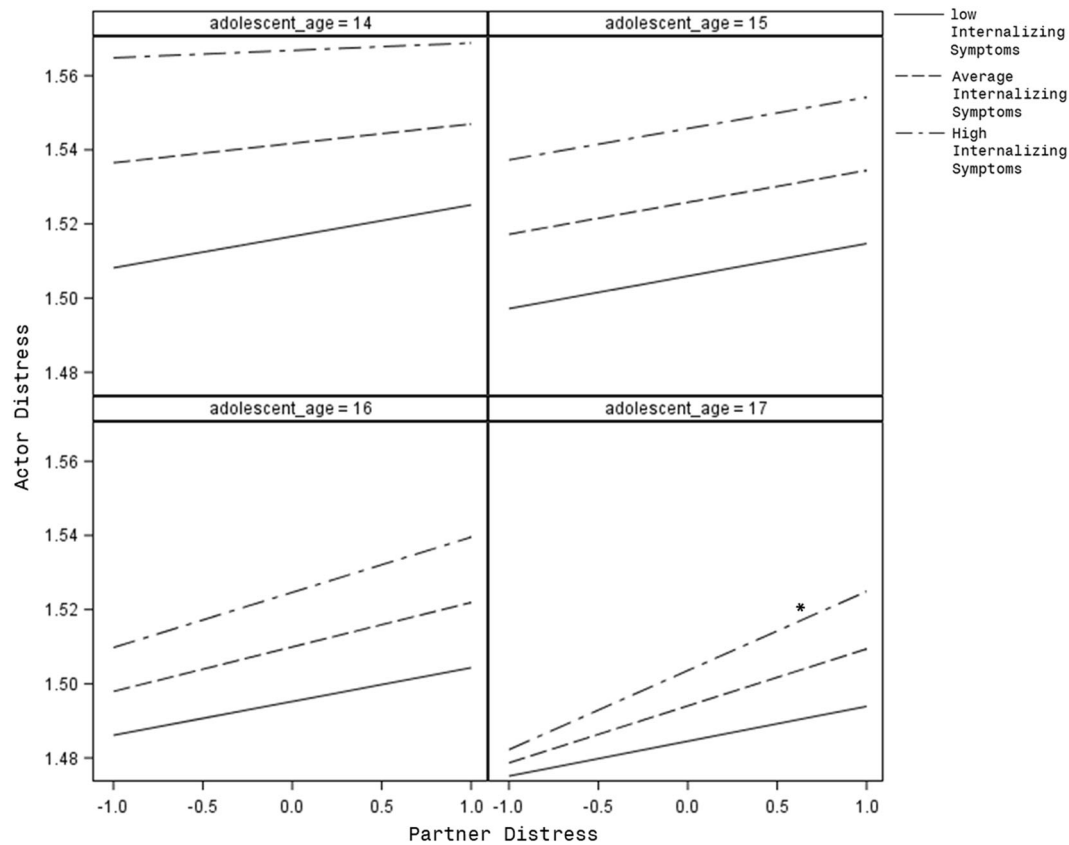


Fig. 2 Coregulation of distress by adolescent internalizing symptom severity across adolescent age. Internalizing systems only exacerbate coregulation of distress levels during later adolescence; associations plotted by adolescent age 14 (top left panel), 15 (top right panel), 16 (bottom left panel), 17 (bottom right panel). Solid lines represent

internalizing symptoms at 1 SD below the mean, dashed lines represent mean levels, and dash dotted lines represent 1 SD above the mean. The figure was made in SAS version 9 (SAS Institute, Inc.) using PROC PLM and PROC SGPPANEL functions

research suggests parents continue to play an important role in shaping adolescent's well-being, an effect that may occur through daily interactions parents and adolescents have in the home. During these daily family interactions, the affective state of one partner may be influenced by the other and vice versa, an interpersonal emotion dynamic that can occur without deliberate effort (Repetti and McNeil 2018). The current study examined how emotions experienced on a day-to-day basis become intertwined between parents and adolescents, and how this synchronous dynamic of matched affect (i.e., emotional coregulation) is influenced by situational and health factors.

The study's findings suggest that when parents and adolescents experience changes in their level of happiness on a given day, the other partner experiences similar changes. Coregulation of happiness was more apparent in families who reported a greater proportion of days in which they got along. The same was not true for daily levels of distress, which were on average unrelated between parents and adolescents. Evidence in support of coregulation of happiness but not distress may be due to the emphasis Latin culture places on expressivity of positive emotions.

Specifically, cultural norms within Latin origin families suggest ideal emotional experiences are higher in positive emotion and harnessing positive emotion expression is utilized to generate and maintain smooth and rewarding social interactions between family members (Holloway et al. 2009; Ruby et al. 2012). Research on other types of close relationships (e.g., dating couples) has found close partners are more accurate at tracking partner displays of positive affect than negative affect, a process called positive emotion attunement, that highlights the importance of positive emotion for affiliation and cooperation (Campos et al. 2015).

Interestingly, the current study found that coregulation of distress was present in families with older adolescents who self-reported heightened levels of internalizing symptoms, a finding that is particularly important given the high rates of anxiety and depression that manifest during this developmental period. The data suggests that around 17 years of age, a robust association between coregulation and internalizing symptoms emerges, with adolescents reporting the highest levels of depression and anxiety exhibiting a coupling of their daily distress levels with their parent's daily

distress. As children progress through adolescence they seek a more peer-like relationship with parents that is characterized by greater mutuality, as a result, they become a more salient source of emotional support for parents (Aquilino 1997). A recent report utilizing the same dataset as the present study, found adolescents were more likely to provide emotional support to parents and family members when parents experienced higher levels of family stress (Tsai et al. 2016). While normative, the increased reliance of parents on adolescents for emotional support may be particularly taxing for adolescents experiencing increased levels of anxiety and depression, with past reports suggesting adolescent caregiving behaviors are linked to higher levels of internalizing behaviors (e.g., Williams and Francis 2010).

Another important developmental change characteristic of adolescence is a desire for greater autonomy and individuation from parents, a process that often results in greater parent–child conflict (Branje 2018). Older adolescents have been found to lead reciprocal negative exchanges during mother–adolescent interactions compared to their younger counterparts (Main et al. 2016), a dynamic that unfolds during episodes of parent–child conflict. And while the link between parent–adolescent conflict and internalizing problems has been extensively documented, adolescent adjustment also has the potential to trigger more conflict and thus coregulation of negative affect (Branje 2018; Yap et al. 2010). As posited by the “stress generation” model of depression, previous decades of research suggest a reciprocal relationship between symptoms of depression and interpersonal stress (Liu and Alloy 2010). Therefore, it is plausible that adolescents or parents with elevated internalizing symptoms are driving coregulation of distress between parent and adolescent. Witnessing one’s own child experiencing distress can be incredibly stressful for parents and lead to dips and spikes in parents’ own affect variability and long-term stress levels. Indeed, the impact of child symptom severity on parental distress has been well-documented (e.g., Crawford et al. 2001), albeit mostly with externalizing behaviors. Although the current study does not provide evidence in support of a causal pathway from adolescent internalizing symptoms to coregulation or examines the role that parents own mental health plays, it does support an association between adolescent mental health and coregulation of daily distress. This suggests that targeting emotional coregulation in parent–adolescent dyads may yield effects on adolescent mental health or vice versa.

Collectivistic cultural orientations, as seen among Mexican American families, have been linked to stronger levels of interpersonal connectedness with others, and a strong emphasis of family obligation and respect (Greenfield et al. 2003; Fuligni et al. 1999). Research on adolescence has also established a link between family assistance behaviors and

positive affect, along with a stronger sense of fulfillment in youth (e.g., Telzer and Fuligni 2009). In light of previous research, family obligation values, family characteristics (support and conflict), and family assistance behaviors were expected to engender positive affect in both adolescents (as providers of family assistance) as well as parents (as the recipient of assistance), potentially amplifying happiness coregulation within each dyad. However, it is plausible that adolescents in the current sample engage in more family assistance behaviors on days that are more stressful for parents as has been observed for adolescents’ patterns of providing emotional support (Tsai et al. 2016). Instead of adolescents and parents experiencing greater happiness on days of greater family assistance, family assistance behaviors on the part of the adolescent may be in response to parental distress. In such a case, coregulation would be harder to detect on days of high family assistance.

Interestingly, there was an association between generational status and coregulation of happiness but not distress. Adolescents born in the U.S. with a parent born in Mexico exhibited the strongest association in daily happiness, a pattern that was statistically different from adolescents born in Mexico (i.e., first generation) but not different compared to families where both youth and parent were born in the United States (i.e., third generation). According to the acculturation gap-distress model, differences in rates by which parents and children adapt to the culture of a host country may negatively impact family functioning and youth adjustment by compounding existing intergenerational stress (Phinney et al. 2000). However, inconclusive evidence has documented negative family functioning associated with differential rates of acculturation between parent and adolescent, and more widely supports the idea that maintaining involvement with cultural values from one’s country of origin is linked to more positive family relationships (Smokowski et al. 2008). Greater coregulation of happiness between parents and youth of second generation may be one example of positive family relationships that result from biculturalism. An alternative explanation is the idea that positive affect may be used as a tool by parents of second-generation youth to facilitate a child’s willingness to endorse parental cultural values (Hernández et al. 2014). In studies in early childhood, children who share positive affect with their mothers are also more likely to comply with their parents’ demands and expectations (Kochanska and Aksan 1995). Finally, previous findings on the current participant sample suggest there are no differences in the level of familism values reported by parents and adolescents across generational status (Telzer et al. 2015), which may partially explain why differences in coregulation exist for generational status but not familism values. This also supports the notion that coregulation of happiness may be a tool parents employ to increase adolescent’s orientation to

Mexican culture. Future research should examine whether indeed coregulation predicts future endorsement of Mexican cultural values.

While the current study extends previous literature on interpersonal emotion dynamics in many important ways, there are important limitations to consider. For one, the present findings may only extend to mother–adolescent dyads given the majority of primary caregivers in the current study were mothers. Exploration of whether coregulation of emotions extends to father–adolescent dyads of Mexican background would be an important next step in the current area of research. Secondly, while the present study employed daily diary methods with end of day assessments across 14 days at two time points a year apart, use of ecological momentary assessments (multiple assessments within a day) would facilitate a more nuanced analysis of how emotions rise and fall in or out of synchrony between youth and caregivers across the day. Lastly, the current paper only examined the association between adolescent depressive symptoms and mother–adolescent coregulation without considering the role of parent's depressive symptoms, future research should examine how both parent and adolescent symptoms shape and are shaped by coregulation of daily mood.

Conclusion

Previous literature suggests emotional coregulation is a characteristic of family relationships and may be related to psychological adjustment in young children, however, studies have not examined whether this interpersonal emotion dynamic is also related to psychological adjustment during adolescence, a transitional period for parent–adolescent relationships marked by decreased closeness. Further, emotional coregulation has not been examined in ethnic minority youth such as Mexican American adolescents, whose family ties may be uniquely shaped by cultural values and who may be at increased risk of developing internalizing symptoms during this developmental period (McLaughlin et al. 2007). The current study examined coupled day-to-day change in positive and negative affect between parents and youth of Mexican heritage and explored the importance of cultural contexts and mental health for this family dynamic. Families who reported increased cooperation (i.e., getting along) and consisted of caregivers who immigrated from Mexico and had children born in the U.S., exhibited greater coregulation of daily happiness. Youth who reported higher levels of internalizing symptoms during late adolescence exhibited greater coregulation of daily distress with their caregiver. Understanding how coregulation is shaped by relationship quality and adolescent's mental health has implications for the

continued importance of the parent–child relationship during this developmental period; a relationship that may be uniquely shaped by ethnic minority status.

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Authors' Contributions E.M. conceived of the research goals, performed the statistical analysis and interpretation of the data, and had primary responsibility for writing the manuscript. J.K. participated in data preparation and helped write and revise the manuscript. N.A.G. conceived of the study, participated in its design and coordination, and helped revise the manuscript. A.J.F. conceived of the study, and participated in its design and coordination, interpretation of the data, and helped draft the manuscript. All authors read and approved the final manuscript.

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Data Sharing and Declaration The data 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 that they have no conflict of interest.

Ethical Approval The research presented received clearance from the Institutional Review Board at the University of California, Los Angeles. 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.

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