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Daily Interactions with Aging Parents and Adult Children: Associations with Negative Affect and Diurnal Cortisol

Kira S. Birditt[a,*], **Jasmine A. Manalel**[a], **Kyungmin Kim**[b], **Steven H. Zarit**[c], and **Karen L. Fingerman**[d]

[a]Institute for Social Research, University of Michigan, Ann Arbor, MI, 48104, USA

[b]Department of Gerontology, University of Massachusetts Boston, Boston, MA, 02125, USA

[c]Department of Human Development and Family Studies, Pennsylvania State University, University Park, PA, 16802, USA

[d]Department of Human Development and Family Sciences, University of Texas at Austin, Austin, TX, 78712, USA

Abstract

Midlife adults report greater investment in their children than in their parents and these ties have important implications for well-being. To date, little research has addressed daily experiences in these ties. The present study examines daily experiences (negative and positive) with aging parents and adult children and their associations with daily negative affect and diurnal cortisol rhythms. Participants were middle-aged adults (N = 156; 56% women) from the *Family Exchanges Study* Wave 2, conducted in 2013, who completed a 7-day daily diary study that included assessments of daily negative and positive social encounters, negative affect and four days of saliva collection, which were collected three times a day (waking, 30 minutes after waking, and bedtime) and assayed for cortisol. Multilevel models revealed that individuals were more likely to have contact with adult children than with parents but more likely to have negative experiences (negative interactions, avoidance, negative thoughts) with parents than adult children. Nevertheless, contact and negative experiences with adult children were more consistently associated with negative affect and daily cortisol patterns than interactions with parents. Findings are consistent with the intergenerational stake hypothesis which suggests that individuals have a greater stake in their children than their parents. Indeed, negative experiences with adult children may be more salient because tensions with adult children occur less frequently than tensions with parents.

Keywords

Intergenerational ties; daily experiences; stress response; negative affect; relationship quality

[*]Corresponding Author at: Institute for Social Research, University of Michigan, 426 Thompson St. Ann Arbor, MI, 48104, USA. Tel: 734-647-4855. kirasb@umich.edu.

This paper has not been published or presented elsewhere. These data have been analyzed extensively and a comprehensive list of publications and presentations are provided on the website (http://sites.utexas.edu/adultfamilyproject/family-exchanges-study/).

The parent-child tie in adulthood is intimately linked with each party's well-being (Birditt & Fingerman, 2013; Umberson, Pudrovska, & Reczek, 2010), yet perceptions of the quality of the tie may vary by generation. The intergenerational stake hypothesis suggests that parents are more invested in their children than the reverse (Bengtson & Kuypers, 1971). Studies including two generations have often shown that middle-aged parents report more positive and less negative feelings about their young adult children than their children report feeling about them (Aquilino, 1999; Shapiro, 2004). Previous literature regarding middle-aged adults and their aging parents reveals that middle-aged children feel more comfortable discussing problems with aging parents, whereas aging parents prefer avoidance (Fingerman, 2003) and aging parents report feeling more closeness and positive relationship quality with their middle-aged children than do those middle-aged children (Giarrusso, Silverstein, Gans, & Bengtson, 2005). Further, there are variations within individuals in their perceptions of overall relationship quality with their parents and their children (i.e., an intra-individual stake). Interestingly, individuals report that ties with adult children are more important but also more negative than ties with their aging parents (Birditt, Hartnett, Fingerman, Zarit, & Antonucci, 2015). It is unclear whether these generational differences extend to daily interactions.

The intergenerational stake hypothesis would also suggest that relationship quality with children may have a stronger effect on psychological and physical well-being than relationship quality with parents. However, the literature is mixed with regard to links between parent-child relationship quality and well-being (Birditt et al., 2015; Umberson, 1992). Umberson (1992) found that greater negative relationship quality with mothers and adult children predicted greater depressive symptoms. Birditt et al. (2015) found that negative relationship quality with parents and not with adult children was associated with middle-aged individuals' depressive symptoms.

One way of gaining a better understanding of the implications of relationship quality for health is to examine more closely the links between daily experiences, daily negative affect and biological systems. One of the most significant biological systems is the hypothalamic pituitary adrenal (HPA) axis which is responsible for the stress response. To our knowledge, the present study is the first to examine daily experiences that individuals have both with their parents and their adult children and the associations of those experiences with negative affect and an indicator of HPA axis functioning (i.e., diurnal cortisol rhythms). The study has two objectives: a) examine whether middle-aged individuals are more or less likely to have negative and positive daily experiences with children than with parents; and b) assess whether daily experiences with parents or children are more consistently associated with negative affect and diurnal cortisol.

Qualities of the Parent-Child Tie in Adulthood

According to solidarity theory, there is a range in positive feelings between parents and children, including the extent to which they experience feelings of closeness, love, caring, and understanding in the relationship (Bengtson, Giarrusso, Mabry, & Silverstein, 2002). The concept of the intergenerational stake hypothesis emerged from solidarity theory suggesting that parents are more emotionally invested in the parent-child relationship than

are their children (Bengtson & Kuypers, 1971). Parents view their children as continuations of themselves and thus perceive more positive feelings and less negative feelings in this tie, whereas children desire greater independence from parents and are more invested in enhancing differences. Older and middle-aged parents typically report greater investment in the tie, greater closeness, and greater positive relationship quality regarding their children than their children do with them (Aquilino, 1999; Shapiro, 2004). Also consistent with the intergenerational stake hypothesis, children tend to report greater conflict and negative relationship quality than do their parents (Aquilino, 1999; Fingerman, 2003). These negative qualities include the extent to which parents and children get on one another's nerves, criticize the other, or make too many demands on one another.

Because of generational differences in the stake, it would logically follow that midlife individuals would report better quality ties with their adult children than their aging parents (i.e., an intra-individual stake). However, in a recent study, Birditt et al. (2015) found that middle-aged individuals reported that their relationships with their children were more important, but also more negative than their relationships with their parents. These findings indicate that greater investment in the child tie may also be associated with greater negativity. It is not clear whether these ratings are reflective of how people interact on a daily basis.

Examining negative and positive experiences on a daily basis may help to further understand within-person variations in middle-aged individuals' experiences with their aging parents and their adult children. The present study examined a range of negative experiences (e.g., negative interactions, avoidance), negative interpersonal thoughts (e.g., worry), and positive experiences (e.g., sharing a laugh) in order to understand whether midlife individuals report different daily experiences with their adult children and their aging parents. We consider both negative interactions, as well as negative thoughts, because close partners may affect well-being even though they do not have contact (Fingerman, Kim, Birditt, & Zarit, 2015). We consider the experience of negative interactions, as well as the avoidance of those interactions, as studies have shown that avoidance may have prolonged effects on cortisol rhythms and negative affect (Birditt, Nevitt, & Almeida, 2014). It is important to consider daily interactions because there is not necessarily a one to one correspondence between reports of overall relationship quality and daily interactions (Charles et al., 2015). For example, on a daily basis, parents report experiencing more positive interactions with children with whom they have both more positive and more negative relationship qualities overall. In addition, parents report having more negative interactions with children with whom they have more negative relationship quality [but positive quality is not associated with negative interactions; (Fingerman et al., 2015)]. It is possible that parents have recall bias when asked to report their overall feelings (more likely to remember negative interactions with individuals they feel more negative about) especially when they are more invested, which may be reduced by asking about daily experiences.

Parent-Child Interactions, Negative Affect, and Cortisol (HPA axis)

Relationships with aging parents and adult children may differentially affect middle-aged individuals' well-being via daily interactions and their implications for daily negative affect

and diurnal cortisol rhythm. Prior research using the data in the present study showed middle-aged parents reported greater negative mood on days in which they had negative interactions and negative thoughts regarding their adult children (Fingerman et al., 2015). There is a lack of research comparing the effects of daily interactions with both aging parents and grown children on midlife adults' daily negative affect.

In addition to negative affect, daily interactions are most likely differentially associated with diurnal cortisol rhythms. Diurnal cortisol production is a primary indicator of the function of the HPA axis (Sapolsky, Romero, & Munck, 2000). Activation of the HPA axis in response to acute challenges is functional because it mobilizes energy for immediate use in an effort to bring the body back to homeostasis, but chronic activation of the system is associated with a multitude of physical and mental health problems (McEwen, 2003). Cortisol has a diurnal rhythm which increases before waking, reaches a peak level at about 30 minutes after waking (cortisol awakening response [CAR]) and steadily declines until bedtime, which is referred to as the daily decline [DEC] (Fries, Dettenborn, & Kirschbaum, 2009). Higher diurnal cortisol levels are associated with greater negative emotion (e.g., anger, stress, anxiety) and poorer well-being (Adam, Hawkley, Kudielka, & Cacioppo, 2006). After repeated or chronic stress, individuals show flatter CAR and DEC (Miller, Chen, & Zhou, 2007). Thus, both high levels of cortisol and flat cortisol rhythms can be indicative of poor health.

Negative social interactions have important implications for diurnal cortisol rhythms. For example, studies of married couples have shown that greater marital tension and lower marital satisfaction is associated with greater positive correlations between husbands' and wives' diurnal cortisol rhythms (Liu, Rovine, Cousino Klein, & Almeida, 2013), and that greater intimacy is associated with lower cortisol levels (Ditzen, Hoppmann, & Klumb, 2008). For example Liu et al. found a positive association between spouses' cortisol awakening responses when there was greater spousal strain, whereas spouses showed a complementary pattern of cortisol awakening responses (negative association) in less strained spousal ties. Further, anticipatory stress, worry, and rumination are associated with elevated cortisol. For example, worry and rumination are associated with higher cortisol in the morning, before the events generating worry that day have even occurred; and this effect is greater on work days, when stressful events are more likely to occur, than on weekend days (Schlotz, Hellhammer, Schulz, & Stone, 2004).

Similarly, worries, rumination, and negative interactions with grown children or parents may be associated with cortisol patterns throughout the day. Research reveals links between stressful and highly negative experiences in the parent-child relationship and young children's flatter cortisol rhythms (Gunnar & Vasquez, 2001; Slatcher & Robles, 2012). Further, research has found links between the diurnal cortisol rhythms of parents and their children. For example, Papp et al. (2009) found that mothers and adolescent children were synchronous in their cortisol levels, especially when they spent more time together.

Studies have also shown that daily interactions with adult children are associated with parents' cortisol levels and diurnal cortisol rhythms, but those studies usually focused on specific populations of adult children. For example, having adult children with severe mental

and physical health problems is associated with hypo-cortisolism (i.e., flatter diurnal rhythms) among parents (Barker, Greenberg, Seltzer, & Almeida, 2012; Bella, Garcia, & Spadari-Bratfisch, 2011; Seltzer et al., 2010). Research using the data in the present study revealed that daily interactions with adult children suffering a variety of life problems (e.g., divorce, health problems, victim of a crime) were associated with parents' diurnal cortisol patterns (Birditt et al., 2015). For example, having any contact with a child with a physical emotional problem was associated with higher overall cortisol levels and negative interactions with such a child predicted a steeper daily decline in cortisol. Negative interactions with children who had lifestyle behavioral problems predicted higher cortisol on the next day. Thus, it appears that negative interactions with adult children can be associated with both higher cortisol and steeper daily declines. These findings indicated that parents may find some interactions with children soothing even though they are negative. In addition, consistent with the previous literature, we considered both same-day and previous-day social interactions effects on cortisol as previous research shows that the links between cortisol and daily stress may be bidirectional (Birditt, Kim, Zarit, Fingerman, & Loving, 2016; Powell & Schlotz, 2012). Cortisol is often higher in the morning on days in which stressful events are anticipated as well as on the day after stressful events (Rohleder, Beulen, Chen, Wolf, & Kirschbaum, 2007). For example, individuals also have higher morning cortisol on days in which they have more negative interpersonal interactions (Birditt et al., 2016). Research suggests that higher cortisol prepares individuals for increased demands and improves ability to cope with those demands (Powell & Schlotz, 2012). It is also possible that heightened cortisol may cause individuals to be more sensitive, leading to increased interpersonal tension.

Present Study

To our knowledge there are no studies examining daily interactions with aging parents and adult children and their associations with negative affect and diurnal cortisol in the middle generation. The present study contributes to the literature on intergenerational ties in adulthood by examining daily negative and positive experiences with both aging parents and grown children and their associations with midlife individuals' negative affect and daily cortisol rhythms. We addressed the following three questions: 1) Are middle-aged individuals more likely to have daily negative experiences (negative interactions, avoidance, and negative thoughts) and positive experiences (laughing, enjoyable interactions) with adult children or aging parents? Based on previous literature, we predicted that middle-aged individuals would be more likely to report negative and positive experiences with adult children than with aging parents; 2) are daily negative and positive experiences with adult children or parents more highly associated with daily negative affect? We predicted that negative and positive experiences with adult children would be more highly associated with middle-aged individuals' negative affect than interactions with parents. In particular, we predicted that negative experiences with children would be associated with increased negative affect, whereas positive experiences would be associated with increased negative affect, whereas positive experiences would be associated with decreased negative affect; and 3) are daily negative and positive experiences with adult children or parents more highly associated with cortisol? We predicted that daily experiences with adult children would be

more highly associated with middle-aged individuals' cortisol than interactions with parents. In particular, we predicted that negative interactions with adult children would be associated with higher levels and flatter rhythms whereas positive interactions would be associated with lower levels and steeper rhythms.

Method

Participants

Participants were middle-aged adults from the *Family Exchanges Study* Wave 2 conducted in 2013. The sample was recruited from the Philadelphia Metropolitan Statistical Area (PMSA) and participated in Wave 1 in 2008. Initial criteria required middle-aged adults to have at least one living parent and one child over age 18. In Wave 2, following completion of a 1-hour main survey, a random selection of participants was invited to complete a diary study consisting of brief telephone interviews for 7 evenings. Of the 311 participants invited, 87% (n = 270) accepted the invitation, 248 participants completed daily interviews, and 203 completed both the daily interviews and the saliva collection before the study was closed. The study received approval from the institutional review boards of the universities involved in the project and all procedures were carried out with the adequate understanding and verbal consent of the subjects in accordance with the Declaration of Helsinki.

Participants completed daily diary interviews on the phone for 7 consecutive days. Interviewers attempted to schedule the calls as close to the same time as possible, each of the seven days so that the questions would capture what happened in the respondents' lives over the preceding 24 hours. In general, calls were scheduled in the evenings so the respondents could relay what happened that day. In a few cases, respondents who worked during a night shift requested morning calls. Respondents received $7 for each completed diary call plus an additional $1 if they completed all seven calls, equaling a maximum incentive of $50.

Collection kits, with salivettes to collect saliva (color-coded by day and time) and a detailed instruction booklet, were mailed to respondents after they completed a main interview and scheduled their first diary call. Interviewers made a reminder call to participants the evening before day 1 of the diary calls to assure respondents understood procedures for collection of saliva samples. Interviewers also prompted respondents to collect the saliva on days 2 to 5 of the diary calls, though allowances were made for deviations from this schedule. Participants were instructed to provide saliva samples when they woke but before they got out of bed, 30 minutes after waking, at noon, and before bed; analyses here focused on the morning rise and decline in cortisol levels and we did not include the noon samples. Participants were instructed not to eat or drink anything other than water, and specifically to avoid caffeinated products (e.g., coffee, tea, soda), 30 minutes before collecting their samples. Participants were also instructed not to brush their teeth before providing the 30 minute waking sample.

Participants recorded the time of collection on the tubes and in a daily log. In addition, during the diary call on saliva collection days, respondents were asked to report their collection times and if they had any problems. In the event there were inconsistencies, we used all three data collection time reports (tube, log, and interview) to discern the most

likely time the saliva was collected. Participants were reminded to store samples in the refrigerator and given instructions and a prepaid express envelope for returning the samples at the end of collection. Participants received $50 for providing saliva samples. Compliance with the saliva protocol was assessed with a series of items including whether the participant provided the sample immediately after waking or before be, at something, consumed caffeine, and/or brushed their teeth within 30 minutes of collection, and refrigerated the sample immediately after collection.

A total of 191 (94%) participants had both a parent and an adult child alive. We excluded participants who did not provide valid saliva samples, therefore 156 participants (56% women) were analyzed. Table 1 includes participant demographics. Participants had an average of 14.58 years of education (*SD* = 2.03) and were aged 55.85 (*SD* = 4.72) on average with an age range from 45 to 65. Participants had an average of 2.60 children aged 18 or older (*SD* = 1.43; range 1 to 11), and 47% of the participants had at least one adult child or parent living with them. Adult children were, on average, age 28.42 (*SD* = 6.98; range 18 to 50) and were 51% female. Participants completed 5 to 7 daily diary interviews with a mean of 6.82 interviews (*SD* = 0.45); 85% of participants completed all seven days of diary interviews. Participants provided saliva on average 3.96 (*SD* = 0.29) of the diary days. A total of 151 participants (96.8%) provided saliva on all four days.

Measures

Negative affect—Participants reported the extent to which they experienced nine negative emotions each day (e.g., distressed, lonely, nervous) from 1 (*none of the day*) to 5 (*all of the day*). Items were derived from previous research on daily negative emotion (Birditt et al., 2014; Piazza, Charles, Stawski, & Almeida, 2013). The items were averaged to create a negative affect score for each day (α = .88).

Cortisol—Saliva samples were frozen and stored at −80 degrees C until analysis. After thawing, salivettes were centrifuged at 3,000 rpm for 5 minutes, which resulted in a clear supernatant of low viscosity. Salivary concentrations, reported in nmol/l, were measured using commercially available chemiluminescence immunoassay with high sensitivity (IBL International, Hamburg, Germany). The intra- and inter-assay coefficients were below 8%.

Duplicate assays were conducted with 25% of the samples (*n* = 194 wake samples; *n* = 195 30 minute samples; *n* = 190 bedtime samples) to establish reliability. Intra-assay coefficients of variation were calculated (i.e., *SD* of the two samples divided by the mean of the samples) for each sample (wake, 30 minutes after wake, bed). The range for the wake and 30 minute intra-assay coefficient of variation was 0.00 to 0.16 (*M* = 0.04, *SE* = 0.03) and the range for the bedtime sample was 0.00 to 0.24 (*M* = 0.07, *SE* = 0.04), indicating excellent reliability.

Cortisol values were removed on a daily basis from the analysis for the following reasons (Supplemental Table 1): participants did not complete a daily interview; participants did not indicate time of sample collection; at least one cortisol value was over 60; respondents were awake fewer than 12 hours or more than 20; and there was less than 15 or more than 60 minutes between the waking cortisol and the 30 minute cortisol. Of the total 617 days with useable saliva data, 109 were removed from the analysis (17.7% of the total days). We

assessed both the skew and kurtosis of each cortisol value; the natural log was calculated for all cortisol scores due to non-normal distributions in the bedtime cortisol. Distributions of cortisol were checked after the natural log transformation and the skew and kurtosis values were in the acceptable range (less than 3 for skew and less than 9 for kurtosis).

Of individuals with both parents and children alive, we compared diary participants who provided useable saliva data (n = 156) with those who did not provide useable saliva data (n = 35). A series of t-tests (for continuous variables) and χ^2 tests (for categorical variables) revealed no significant differences in participant characteristics (i.e., race, gender, education, neuroticism, depressive symptoms, anxiety) of individuals who did not provide useable saliva with those who provided useable saliva data.

Daily experiences—Participants answered a series of questions about their interactions with each of their adult children and their parents, on each day, on the following dimensions:

Contact: Participants indicated whether they had any contact with each of their adult children and each parent that day (by phone, email, in person). Each day was coded with two scores: adult child contact (0 = *did not have contact with adult child* or 1 = *had contact with an adult child*) and parent contact (0 = *did not have contact with a parent* or 1 = *had contact with a parent*).

Negative interactions: Participants responded to two items regarding negative interactions with each adult child and each parent (yes/no): “Did you have any interactions that made you feel irritated, hurt or annoyed?” and “Did (mother, father, child) get on your nerves?” Each day was coded with two scores: child negative interaction (0 = *did not have negative interaction with adult child* or 1 = *had negative interaction with an adult child*) and parent negative interaction (0 = *did not have negative interaction with a parent* or 1 = *had negative interaction with a parent*).

Avoidance of negative interactions: Participants were asked, “Did you have any interactions in which you could have felt irritated, hurt or annoyed but decided not to be?” Each day was coded with two scores: adult child avoid (0 = *did not avoid negative interaction with adult child* or 1 = *avoided interaction with adult child*) and parent avoid (0 = *did not avoid negative interaction with a parent* or 1 = *avoided negative interaction with a parent*).

Negative thoughts: Participants were asked two items regarding negative thoughts about each adult child and each parent (yes/no): “Did you worry about your adult child/parent?” and “Did think about a relationship problem with your adult child/parent?” Each day was coded with two scores: adult child negative thought (0 = *did not have negative thought about adult child* or 1 *= had negative though about adult child*) and parent negative thought (0 *= did not have negative thought about parent* or 1 = *had negative thought about parent*).

Positive interactions: Participants reported whether they had a particularly enjoyable interaction and whether they shared a laugh with each grown child and each parent. Each day was coded with two scores: adult child positive (0 = *did not have positive interaction*

with adult child or 1 = *had positive interaction with an adult child*) and parent positive (0 = *did not have positive interaction with parent* or 1 = *had positive interaction with a parent*).

Covariates—We controlled for several participant characteristics including gender (−1 = *woman*, 1 = *man*), continuous age, years of education, race (1 = *white*, −1 = *non-white*), coresidence with parents or children (1 = *yes*, −1 = *no*), neuroticism, anxiety, depressive symptoms, and number of living children. To assess neuroticism, participants rated the extent to which four characteristics described them (i.e., moody, worrying, nervous, calm [reverse-coded]) from 1 (*not at all*) to 5 (*a great deal)* (Lachman & Weaver, 1997). An average was created of the four items (α = .70). Participants reported their depressive symptoms items from the Brief Symptom Inventory (Derogatis & Melisaratos, 1983). They reported the extent to which they experienced feeling lonely, blue, no interest in things, hopeless about the future, and feelings of worthlessness, during the last 7 days, from 1 (*not at all*) to 5 (*extremely*). Items were averaged to create a depressive symptoms score (α = .88). Participants reported their anxiety with five items from the patient health questionnaire (Spitzer et al., 1994). Participants reported whether they experienced an anxiety attack within the past 4 weeks. An individual is considered to have an anxiety disorder if he/she answers “yes” to one of the follow-up four questions such as “Did this attack bother you a lot or are you worried about having another attack?”

We also controlled for factors that are known to influence cortisol patterns including medication use, smoking, wake time, weekend day, and sleep quality. Each day, participants indicated yes (1) or no (0) to whether they were taking the following medications: over the counter/prescription allergy medication; steroid inhaler; other steroid medication; medications/creams containing cortisone; birth control pills; other hormonal medications; or anti-depressants or anti-anxiety medication. We summed the number of these medications. We also controlled for smoking on the particular day (−1 = *did not smoke*, 1 = *yes, smoked cigarettes*) and whether the data were collected on a weekend day (−1 = *weekday*, 1 = *weekend day*). Finally, participants rated the quality of their sleep on the previous night from 1 (*poor*) to 5 (*excellent*).

We also considered whether investment, positive relationship quality and negative relationship quality, accounted for variations in daily experiences in a series of posthoc analyses. Participants rated the importance of each parent and adult child compared with their other social relationships: 1 (*most important person in your life*); 2 (*among the 3 most important*); 3 (*among the 6 most important*); 4 (*among the 10 most important*); 5 (*among the 20 most important*); and 6 (*less important than that*). The item was reverse-coded so higher numbers reflected greater importance (Birditt et al., 2015). Positive qualities of the relationship included two items: “Overall, how much does your (father/mother/child) love and care for you?” and “How much does your (father/mother/child) understand you?” Negative qualities included two items: “How much does your (father/mother/child) criticize you?” and “How much does your (father/mother/child) make demands on you?” Participants rated the items on a 5-point scale (1 = *not at all* to 5 = *a great deal*). The items were averaged to create positive and negative quality scores (Spearman-Brown coefficient range from .59 to .80).

Analysis Strategy

We first examined the frequency of each type of interaction and estimated chi-square tests. Next, we examined whether there were differences in the types of interactions with each generation (parent/grown child) via three-level multilevel models in which generation (−1 = *adult child*, 1 = *parent*) was the predictor and the outcome was each type of interaction. The upper level was the participant, the second level was the family member, and the lowest level was the day. We estimated the models using the SAS GLIMMIX macro with binomial outcomes. Similar to previous research (Birditt et al., 2015), we included gender, age, race, education, family size, neuroticism, depression, anxiety, and coresidence as covariates. All continuous covariates were grand mean centered and categorical covariates were effect coded.

We estimated two-level multilevel models to examine whether daily experiences predicted negative affect. The lower level reflected the day and the upper level referred to the participant. For these models, we collapsed across all adult children (child score) and collapsed mother/father (parent score) and used scores that reflected whether the respondent interacted with any adult child or any parent that day. We estimated separate models to determine whether contact, negative interactions, avoidance of negative interactions, negative thoughts and positive interactions with an adult child or with a parent, on the same and the previous day, predicted negative affect. We included negative affect on the previous day, gender, age, race, education, family size, neuroticism, depression, anxiety, and coresidence as covariates.

Finally, we estimated three-level piecewise multilevel models to assess whether midlife individuals' cortisol rhythms varied by daily experiences with aging parents and adult children (SAS PROC MIXED). The lowest level referred to the cortisol measurement within day, the second level referred to the day, and the upper level referred to the participant. Similar to the models predicting negative affect, we collapsed across all adult children and across mother/father and used scores that reflected whether the respondent interacted with any adult child or any parent. We estimated models separately for each type of daily experience (e.g., contact, negative interactions). Piecewise models captured the within-day rhythm of cortisol with two predictors (i.e., pieces) that represented the CAR (time difference between waking and 30 minute collection) and the daily decline (DEC; time difference between 30 minute collection and bedtime collection) centered on the 30 minute collection. Based on a comparison of models, the best fitting model included a random effect for the intercept at the upper level and at the second level. Models also included a quadratic effect for the daily decline. Additional models were estimated to assess whether the quadratic effect of daily decline varied by interactions, but since those estimates were not significant they were removed from the model.

In step 1 we included the main effects of daily experiences to assess whether experiences with adult children or parents predicted overall cortisol levels and in step 2 we included the pieces (CAR, DEC) and the daily experiences to assess links between daily experiences and the diurnal cortisol curve over the day. The predictors included same day experiences as well as experiences on the day before. For example, to assess whether negative interactions with adult children or with parents were associated with diurnal cortisol rhythms, we estimated

models with four dichotomous predictors: a) same day negative interaction with an adult child; b) previous day negative interaction with an adult child; c) same day negative interaction with a parent; and d) previous day negative interaction with a parent. Models controlled for gender, age, race, education, family size, neuroticism, coresidence, wake time, weekend day, smoking, medication use, depressive symptoms, anxiety, and sleep quality. All upper level continuous covariates were grand mean centered and lower level continuous covariates were group mean centered. We also considered whether to control for whether the participant failed to follow the directions at least once that day and results remained stable. We assessed whether there was a significant difference between the fit of the models by subtracting the −2 log likelihood (−2LL) estimations of models and examining differences on a chi-square distribution with degrees of freedom equaling the change in number of parameters (Singer & Willett, 2003).

Results

Description

We examined the percentage of occasions (family members × diary days) midlife participants had contact and each type of negative experience with aging parents and adult children (Supplemental Table 2). Participants reported having contact with adult children on 50% of the occasions and contact with aging parents on 40% of the occasions. Of all the types of negative experiences, midlife respondents were most likely to report negative thoughts (32% parents, 22% adult children). The least frequent type of negative experience included negative interactions (8% parents, 6% adult children). Midlife individuals reported positive interactions with parents on 32% of the occasions and interactions with adult children on 38% of the occasions. Cortisol levels increased in the morning and declined over the day. Midlife participants woke up on average at 6:44 AM and went to bed at 10:59 PM (Supplemental Table 1).

Does the Likelihood of Experiencing Daily Experiences Vary by Generation?

Multilevel models were estimated to examine whether the likelihood of contact, negative interactions, avoidance of negative interactions, negative thoughts, and positive interactions varied by generation (Supplemental Table 3). Models revealed a significant effect of generation when predicting contact. Middle-aged participants were 1.2 more times likely to have contact with adult children than with parents. Middle-aged participants were also more likely to report negative interactions (1.3 times), avoiding negative interactions (1.5 times), and negative thoughts (1.5 times) about aging parents than with adult children. There was no generation difference in the likelihood of having daily positive interactions.

Are Interactions with Parents or with Adult Children More Highly Associated with Daily Negative Affect?

Multilevel models revealed no significant associations between **contact** and negative affect, or positive interactions and negative affect, but there were links between negative experiences and negative affect (Table 2).

Negative interactions—Negative interactions with adult children predicted greater negative affect on the same day and next day. Negative interactions with aging parents predicted greater negative affect on the same day.

Avoidance of negative interactions—Avoidance of negative interactions with adult children was associated with greater negative affect on the next day. Avoidance of negative interactions with parents predicted greater negative affect on the same day.

Negative thoughts—Negative thoughts regarding adult children predicted greater negative affect on the same day. Negative thoughts about parents predicted greater negative affect on the next day.

Are Experiences with Parents or Adult Children More Highly Associated with Cortisol?

Contact—Contact with children and with parents were associated with diurnal cortisol rhythms. Contact with adult children was associated with a steeper decline in cortisol over the course of the day (Table 3). Contact with parents was associated with a flatter decline in cortisol on the next day (which may indicate greater physiological stress). We explored whether the contact was associated with cortisol levels at particular times of the day and found that contact with parents predicted higher bedtime cortisol levels on the next day, albeit marginally ($b = 0.14$, $SE = 0.08$, $p = .07$). There were no significant associations between contact with children and cortisol levels at particular times of the day.

Negative interactions—Negative interactions with adult children and not with parents predicted diurnal cortisol rhythms. Negative interactions with adult children were associated with same and next day steeper decline (which may indicate lower physiological stress). Models by occasion showed that negative interactions with children were associated with higher waking cortisol levels on the same day ($b = 0.14$, $SE = 0.08$, $p = .08$) and lower bedtime cortisol levels on the same ($b = -0.21$, $SE = 0.12$, $p = .08$) and next day ($b = -0.28$, $SE = 0.11$, $p < .05$).

Avoidance of negative interactions—Avoidance of negative interactions with children and not with parents were linked with diurnal cortisol rhythms. In particular, avoiding interactions with adult children was associated with same day steeper decline (which may indicate less physiological stress). The models for each occasion showed that avoiding negative interactions with children was associated with lower bedtime cortisol levels on the same day ($b = -0.25$, $SE = 0.11$, $p < .05$).

Negative thoughts—Negative thoughts about adult children were associated with a steeper same day decline in cortisol (which may indicate less physiological stress). There was no association between negative thoughts about parents and diurnal cortisol rhythms. Examining the models for each occasion revealed that thinking negative thoughts about an adult child was associated with higher cortisol levels 30 minutes after waking on the same day ($b = 0.15$, $SE = 0.05$, $p < .01$) and higher cortisol levels at waking on the next day albeit marginally ($b = 0.11$, $SE = 0.06$, $p = .06$).

Positive interactions—Positive interactions with parents were associated with a flatter decline in cortisol on the next day (which may indicate greater physiological stress). Examining the models for each occasion revealed no significant associations between positive interactions and cortisol levels. Positive interactions with adult children were not associated with and same or previous day cortisol diurnal cortisol rhythms.

Post Hoc Tests

Because overall feelings of investment and relationship quality may account for generation differences in daily experiences, we estimated another series of models with relationship quality and investment in the tie as covariates in the models predicting generation differences in daily experiences. The same pattern of results with regards to generation differences in daily experiences emerged across all models. Next, we considered whether geographic proximity (in miles) accounted for the generation differences and the results remained stable.

We conducted an additional analysis examining whether the likelihood of interactions (contact, negative, avoid, negative thoughts, positive) varied by gender of the interaction partner (i.e., child or parent). There was a main effect of the gender of partner ($p \leq .05$) such that people were more likely to have every type of interaction, with women (mothers and daughters) than with men (fathers and sons). Follow up analyses examined whether interacting with sons vs. daughters, and mothers vs. fathers, were differentially linked with negative affect and cortisol level. Models predicting negative affect revealed that same day negative interactions with daughter were associated with higher negative affect. Same day positive interactions with mother were associated with higher negative affect. Models predicting diurnal cortisol rhythms revealed that same day contact with daughters predicted a flatter decline in cortisol (which is considered a sign of greater physiological stress). Negative interactions with daughters predicted lower cortisol levels and a steeper decline in cortisol on the next day.

Discussion

This study showed that middle-aged individuals have more contact with adult children than with aging parents, but more negative experiences with aging parents than with adult children. Despite these generation differences, daily negative experiences with adult children are more consistently associated with daily negative affect and diurnal cortisol rhythms. These findings are consistent with the concept of the intra-individual stake hypothesis which suggests that middle-aged individuals have greater stake in their children than their parents and that interactions with adult children are more consequential for well-being than interactions with parents.

Generation Differences in Daily Experiences

Although middle-aged individuals were more likely to have contact with adult children than parents, they reported more negative experiences with parents than children. In particular, middle-aged individuals were more likely to report negative interactions, avoidance of negative interactions, and negative thoughts about their parents than their adult children.

This finding is inconsistent with previous work suggesting that individuals report greater overall negative relationship quality with children than with parents (Birditt et al., 2015).

It appears that overall feelings regarding relationships are not reflected in the same way in daily life. This is consistent with previous research findings suggesting that retrospective reports are not always consistent with reports regarding daily life (Charles et al., 2015). These findings are in line with research and theory regarding the intergenerational stake which has found that individuals report more closeness and investment in their children than their parents.

Daily Interactions with Parents and Adult Children and Negative Affect

Overall, having any contact or positive interactions were not associated with negative affect, but negative interactions with both adult children and parents predicted increased negative affect. In particular, negative experiences (negative interactions and avoidance) with children and with parents predicted increased same day negative affect, but interactions with children (and not with parents) also predicted increased negative affect on the next day. However, negative thoughts regarding children were associated with increased same day negative affect but negative thoughts about parents predicted increased negative affect on the next day. Thus, it appears that negative interactions (negative, avoidance) with children tend to have more lingering effects on negative affect whereas negative thoughts with parents have a more lingering effects. While previous research using these data has found that negative interactions with adult children are associated with negative affect (Fingerman et al., 2015), this study is the first to our knowledge, to compare interactions with parents and children on a daily basis. These findings are interesting as individuals are more likely to report every type of negative experience with parents than adult children, but the effects of those interactions on daily negative affect vary by generation. We believe these findings provide evidence of the intra-individual stake which suggests that interactions with adult children have a greater impact on well-being than interactions with parents because of a greater stake in relationships with children than with parents.

The only types of experiences with parents that had a lasting impact on next day negative affect involved negative thoughts (i.e., thinking about problems and worries) and positive interactions, which were associated with higher negative affect on the next day. This finding is in line with previous literature regarding filial anxiety which indicates that individuals experience increased worries about their parents as they grow older due to fears regarding impending health problems and mortality as well as future care expectations (Cicirelli, 1988). Indeed, positive interactions may occur simultaneously with negative thoughts, similar to the research on ambivalence which indicates that adult children have simultaneously positive and negative feelings about ties with parents (Fingerman et al., 2008). Further, individuals experience greater worry in more positive relationships (Hay, Fingerman, & Lefkowitz, 2007).

Implications of Daily Experiences with Parents and Adult Children for Cortisol

Overall, interactions with both adult children and aging parents were associated with diurnal cortisol rhythms, but the specific associations varied by generation. Contact with adult

children was associated with a steeper decline in cortisol over the course of the day, whereas contact with parents was associated with a flatter decline in cortisol on the next day. Thus, it appears that although contact is not associated with negative affect, it is associated with diurnal cortisol rhythms. It is possible that contact with children is more soothing to individuals than contact with parents. There may be biological implications of the parent child tie that exist from birth into adulthood due to feelings of attachment and engagement (Hinde & Stevenson-Hinde, 1990).

Similar to the findings regarding next day negative affect, negative experiences with adult children were more consistently associated with diurnal cortisol rhythms than were interactions with parents. Interestingly we found no links between negative experiences with parents and diurnal cortisol rhythms but positive interactions with parents were associated with a flatter decline in cortisol on the next day (which may indicate greater physiological stress). Negative interactions, avoiding negative interactions, and negative thoughts with adult children were associated with same day steeper decline. Negative interactions with adult children were also associated with a steeper decline on the next day which may indicate less physiological stress as flatter declines tend to be linked with greater stress. Middle-aged individuals may be soothed by their interactions with adult children, even if those interactions are negative, but find interactions with parents more stressful (even if they are also positive). Indeed our previous research using the data in the present study revealed that daily interactions with adult children suffering a variety of life problems (e.g., divorce, health problems, victim of a crime) were associated with parents' diurnal cortisol patterns (Birditt et al., 2015). For example, having any contact with a child with a physical emotional problem was associated with higher overall cortisol levels and negative interactions with these children predicted a steeper daily decline. The present study findings move beyond the literature on problematic children and indicate that negative interactions with children, while predictive of negative affect, are also associated with a steeper daily decline in cortisol which may be indicative of reduced stress; however much more work needs to be done to understand the meaning of the daily decline. In addition, this study shows that positive interactions with parents have unexpected associations with daily well-being and diurnal cortisol rhythms, indicating that they may be positive but also stressful.

Overall, it appears that daily interactions with adult children are more likely to get under parents' skin than interactions with parents. Negative experiences were less likely to occur with adult children than with parents. Thus, these interactions may have more meaning because they are less predictable and occur less frequently (Markman, Rhoades, Stanley, Ragan, & Whitton, 2010; Rook, 2015). These findings are consistent with the intra-individual stake hypothesis suggesting that people have a greater stake in their children than in their parents (Birditt et al., 2015). Thus, upsetting encounters with adult children have a greater biological impact than those with parents. Interestingly, contact and positive interactions with parents appear to be stressful according to their associations with diurnal cortisol which may be due to factors such as filial anxiety and worries regarding aging parents.

Limitations and Future Directions

This study has limitations that can be addressed in future research. Unfortunately, although daily diary methods have many benefits, including the ability to examine within person associations, it is still not possible to discern the exact timing of events. For example, an increase in negative affect may lead to an increased likelihood of experiencing negative interactions. Further, although daily diary methods reduce issues due to retrospective recall biases, participants may still have difficulties recalling events that happened earlier in the day and their mood at the end of the day may affect their ability to recall events that are not congruent with their mood. Next, the particular interpersonal processes that took place during the interactions are not known. We do not know, for example, what types of interpersonal coping strategies parents and children are using with one another, how they appraised the encounters, or the particular topics that are causing tensions all of which are important for well-being (Birditt et al., 2014). Longitudinal studies should be conducted to more fully understand how parent-child relationship history may influence daily interactions over time and whether there are bidirectional effects between daily well-being and interpersonal relationships. Future studies should also address the extent to which the parent-adult child tie has implications for other important biological systems such as the cardiovascular and immune systems. Finally, it would be fascinating to understand the implications of daily interactions for both dyad members.

Overall, there are generation differences in daily experiences and the implications of those experiences. Although middle-aged participants are more likely to report negative experiences with their parents than their children, negative experiences with adult children are more pervasively linked with daily negative affect and diurnal cortisol rhythms. We need further research to understand how and why individuals are able to reduce the negative implications of daily social interactions with some member of their families but not with others.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sample Characteristics

	M	(*SD*)	Range	%	(*n*)
Respondent characteristics					
Age	55.85	(4.72)	45 – 65		
Education	14.58	(2.03)	10 – 17		
Number of adult children	2.60	(1.43)	1 – 11		
Neuroticism	2.60	(0.74)	1 – 4.5		
Depression	1.49	(0.64)	1 – 4		
Female				55.8	(87)
White				71.2	(111)
Anxiety				13.5	(21)
Coresiding with parents or children				47.4	(74)
Live with adult children				41.0	(64)
Live with parent				10.9	(17)
Parent characteristics					
Both living				34.0	(53)
Only mother living				51.3	(80)
Only father living				14.7	(23)

Note. Middle-aged participant $N = 156$.

Table 2

Daily Experiences with Parents and Children and Middle-Aged Adults' Negative Affect

	b (*SE*)
Any contact	
Same day with parents	0.02 (0.02)
Previous day with parents	−0.00 (0.02)
Same day with children	0.01 (0.02)
Previous day with children	−0.00 (0.03)
Negative interactions	
Same day with parents	0.11 (0.03)**
Previous day with parents	−0.02 (0.03)
Same day with children	0.13 (0.03)***
Previous day with children	0.07 (0.03)*
Avoidance of negative interactions	
Same day with parents	0.08 (0.03)*
Previous day with parents	−0.03 (0.03)
Same day with children	0.05 (0.03)
Previous day with children	0.08 (0.03)**
Negative thoughts	
Same day with parents	0.01 (0.02)
Previous day with parents	0.06 (0.02)*
Same day with children	0.08 (0.02)**
Previous day with children	0.04 (0.02)
Positive interactions	
Same day with parents	0.04 (0.02)
Previous day with parents	0.00 (0.02)
Same day with children	−0.01 (0.02)
Previous day with children	0.02 (0.02)

Note. Models controlled for gender, age, education, family size, race, coresidence, neuroticism, depression, and anxiety, and lagged negative affect. Models testing negative interactions *(−2LL* = 225.3), avoidance *(−2LL* = 244.5), and negative thoughts *(−2LL* =233.4) showed significantly improved fit from the model with only the covariates (*−2LL* = 261.8)

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Daily Experiences with Parents and Children and Middle-Aged Adults' Diurnal Cortisol Rhythms

	Step 1	Step 2		
	INT	INT	CAR	DEC
	b (*SE*)	*b* (*SE*)	*b* (*SE*)	*b* (*SE*)
Any contact				
Same day with parents	−0.02 (0.04)	−0.00 (0.05)	−0.09 (0.12)	−0.00 (0.00)
Previous day with parents	0.05 (0.04)	−0.00 (0.05)	0.04 (0.12)	0.01 (0.00)*
Same day with children	−0.00 (0.04)	0.08 (0.06)	−0.10 (0.13)	−0.01 (0.01)*
Previous day with children	0.04 (0.05)	0.05 (0.06)	−0.04 (0.14)	−0.00 (0.01)
Negative interactions				
Same day with parents	−0.03 (0.06)	−0.07 (0.08)	0.03 (0.19)	0.01 (0.01)
Previous day with parents	0.00 (0.06)	−0.06 (0.08)	0.22 (0.17)	0.01 (0.01)
Same day with children	−0.02 (0.06)	0.03 (0.08)	0.10 (0.18)	−0.01 (0.01)*
Previous day with children	−0.04 (0.06)	0.05 (0.07)	−0.01 (0.16)	−0.02 (0.01)**
Avoidance of negative interactions				
Same day with parents	−0.07 (0.06)	−0.09 (0.08)	0.03 (0.18)	0.00 (0.01)
Previous day with parents	0.06 (0.05)	−0.01 (0.07)	0.14 (0.17)	0.01 (0.01)
Same day with children	−0.07 (0.05)	0.03 (0.07)	−0.11 (0.16)	−0.02 (0.01)**
Previous day with children	0.07 (0.05)	0.07 (0.07)	−0.05 (0.16)	0.00 (0.01)
Negative thoughts				
Same day with parents	−0.02 (0.04)	−0.04 (0.06)	0.04 (0.14)	0.00 (0.01)
Previous day with parents	0.06 (0.04)	0.03 (0.06)	0.11 (0.14)	0.00 (0.01)
Same day with children	0.03 (0.04)	0.12 (0.06)*	−0.22 (0.14)	−0.01 (0.01)*
Previous day with children	0.00 (0.04)	−0.02 (0.06)	0.17 (0.13)	−0.00 (0.00)
Positive interactions				
Same day with parents	−0.02 (0.07)	−0.05 (0.09)	0.04 (0.19)	0.00 (0.01)
Previous day with parents	0.08 (0.07)	−0.02 (0.09)	0.08 (0.19)	0.02 (0.01)*
Same day with children	0.03 (0.07)	−0.03 (0.10)	−0.04 (0.21)	0.01 (0.01)
Previous day with children	0.03 (0.07)	0.08 (0.10)	−0.26 (0.21)	−0.00 (0.01)

Note. INT = intercept; CAR = cortisol awakening response; DEC = daily decline.

Models include the quadratic decline and controlled for gender, age, neuroticism, education, race, weekend day, coresidence, number of children, wake time, medication use, anxiety, depressive symptoms, sleep quality the night before, and smoking. All models with significant effects (−2LL = contact 2865.9, negative 2862.7, avoid 2861.9 negative thoughts 2868.4, positive 1041.6) showed a significantly improved fit from the model with covariates (−2LL = 2974.2).

* $p < .05$.

** $p < .01$.

*** $p < .001$.