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Better Together: Coexperienced Positive Emotions and Cortisol Secretion in the Daily Lives of Older Couples

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An emerging body of research suggests that shared positive emotions predict health and longevity over and above individually experienced positive emotions. However, the extent to which relationship partners coexperience positive emotions in daily life remains poorly understood. Moreover, while laboratory research shows important distal effects of shared positive emotions on health and longevity, the extent to which positive emotions may "get under the skin," shaping proximal biomarkers in everyday life, is unclear. In response, the present research harmonized data from three intensive measurement studies to investigate coexperienced positive emotions in couples' daily lives and the links with momentary cortisol secretion in 321 older adult couples aged 56–89 years. Results showed that on occasions when relationship partners were together, both partners reported positive emotions higher than their usual at approximately 38% of occasions. Adjusting for age, sex, assay version, partner's mean positive emotions, diurnal cortisol rhythm, medication, behaviors that may influence cortisol secretion, and person-mean centered positive emotions, coexperienced positive emotions were associated with lower concurrent cortisol secretion. Findings did not differ across age, sex, or relationship satisfaction. Furthermore, coexperienced positive emotions were associated with lower cortisol at the subsequent assessment but not vice versa, suggesting potentially enduring physiological impacts of coexperienced positive emotions beyond the present moment. Together, findings show that coexperienced positive emotions are associated with lower momentary cortisol secretion over and beyond individually experienced positive emotions, emphasizing the importance of fostering shared positive emotions in close relationships to promote physiological responding in older adulthood.

Keywords: positivity resonance, affect, older adulthood, dyads, cortisol

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Positive emotions are deeply embedded and play an important role in the fabric of our lives. Cross-sectional, longitudinal, and experimental evidence shows that experiencing more positive emotions is associated with higher well-being and life satisfaction (Franke et al., 2017; Fredrickson, 2000; Le Nguyen & Fredrickson, 2017; Xu & Roberts, 2010); better cardiovascular, endocrine, and immune health outcomes (Boehm et al., 2020; Kok & Fredrickson, 2010; Pressman & Cohen, 2005); and a longer life (Carstensen et al., 2011; Danner et al., 2001; Steptoe, 2019).

Interestingly, the vast majority of research has considered positive emotions at the individual level, despite positive emotions being experienced most frequently and most intensely in the context of social relationships (Gross et al., 2006; Levenson et al., 2014; Stephens et al., 2022). Drawing on positivity resonance theory (Fredrickson, 2016), an emerging body of research has begun to document the importance of positive emotions that are shared between two or more people through interaction and mutual engagement, which is conceptualized as *positivity resonance*. This research shows that shared positive emotions predict health and longevity over and above the contribution of individually experienced positive emotions (e.g., Wells et al., 2022). Previous research has measured shared positive emotions in the laboratory during prompted dyadic interactions between couples as well as perceived positivity resonance via self-report questionnaires. However, the extent to which relationship partners coexperience positive emotions in daily life remains poorly understood. Moreover, while laboratory research has documented important distal effects of shared positive emotions on health and longevity, it is an open question whether shared positive emotions "get under the skin" and shape proximal biomarkers in everyday life. Guided by positivity resonance theory (Fredrickson, 2016), this research harmonizes data from three intensive measurement studies to investigate coexperienced positive emotions in couples' daily lives and the links with cortisol secretion within 321 older adult couples aged 56–89 years.

Positive Emotions and Health

Positive emotions (e.g., contentment, happiness, interest), which represent a dimension distinct from negative emotions (Rush & Hofer, 2014; Watson et al., 1988), are valuable not only for intrinsic enjoyment but also for physical health and longevity (Ong, 2010; Pressman & Cohen, 2005; Pressman et al., 2019; Xu & Roberts, 2010; Zhang & Han, 2016). Early studies documenting associations between positive emotions and both health and longevity across decades (e.g., Carstensen et al., 2011; Danner et al., 2001) sparked a deep interest in the proximal, underlying physiological processes. The broaden-and-build theory of positive emotions (Fredrickson, 2004) proposed that momentary positive emotions may *broaden* attention and thinking, which encourages opportunities to foster and *build* personal resources, leading to improvements in psychological resilience, personal resources, coping, and survival. Research embedded in this theory has demonstrated a physiological "undoing effect" of positive emotions (Fredrickson, 2004; Levenson, 2003). For example, laboratory-based studies showed that after experiencing negative emotions, positive emotions sped up cardiovascular recovery (Fredrickson et al., 2000; Fredrickson & Levenson, 1998). A review synthesizing studies ($k = 25$) focused on physiological biomarkers further highlights the importance of positive emotions for health, showing that positive emotions were related to healthier immune function, such as reduced inflammation, lower norepinephrine, faster healing, and more robust vaccination responses (see Marsland et al., 2007).

Beyond laboratory-based studies, daily diary studies have shown similar effects. For example, research shows that daily positive emotions mitigate the effects of negative emotions on blood pressure in older adults (Ong & Allaire, 2005). Although individuals exhibited higher than usual blood pressure on days they experienced more negative emotions, experiencing positive emotions reduced or *undid* the cardiovascular activation that followed the negative emotions (Ong & Allaire, 2005). Similarly, a meta-analysis synthesizing ecological momentary assessment studies examining the biopsychological pathways linking stress processes to health ($K = 19$) found that more positive emotions were reliably associated with lower momentary cortisol secretion (see Joseph et al., 2021). That is, on occasions when individuals reported more positive emotions compared to their usual, they also tended to have lower momentary cortisol (e.g., Pauly, Drewelies, et al., 2021). Consistent with the literature focusing on links between positive emotions and markers of proximal physiological responding, research also shows evidence for longitudinal physiological correlates of positive emotions, such as reduced fibrinogen stress responses, lower ambulatory heart rate, and lower ambulatory systolic blood pressure (Steptoe et al., 2005; Steptoe & Wardle, 2005). Together, the beneficial effects of positive emotions on proximal and longitudinal physiological correlates may contribute to distal health outcomes, such as longevity (Steptoe, 2019). Indeed, a meta-analysis ($K = 22$) found that the risk of mortality was approximately 15% lower for middle-aged and older adults (55+ years) who reported more positive emotions compared to those who reported fewer positive emotions (Zhang & Han, 2016).

In sum, the existing literature has provided substantial evidence documenting the importance of positive emotions for physiological functioning at the individual level. Yet, this work predominantly neglects that positive emotions occur most often and most intensely within the context of social relationships (Gross et al., 2006; Levenson et al., 2014; Stephens et al., 2022).

Coexperienced Positive Emotions and Health

Positivity resonance theory (Fredrickson, 2016) proposes an affective science framework for investigating the mechanisms and correlates of shared positive emotions on microtimescales (i.e., positivity resonance) in dyads or groups (*also see* Butler, 2011).

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Expanding upon the broaden-and-build theory of positive emotions (Fredrickson, 2004) and drawing upon developmental science and relationship science, the theory emphasizes the characteristics of shared positive emotions (Fredrickson, 2016) as well as the extensive links with health and well-being (Wells et al., 2022). Specifically, positivity resonance describes moments when positive emotions are shared between two or more individuals through interaction and mutual engagement (Wells et al., 2022). Similar to how positive emotions accumulate at the individual level and eventually contribute to life satisfaction (Cohn et al., 2009; Fredrickson, 2004), positivity resonance theory proposes that moments of shared positive emotions accumulate and eventually produce more enduring positive feelings toward another person, such as intimacy, trust, and desire, which in turn can translate into benefits for health and survival (Wells et al., 2022). Thus, positivity resonance is thought to be most common in the context of lasting supportive social relationships, though it can also be experienced between any two individuals (or more), including strangers and acquaintances (Fredrickson, 2016).

Positivity resonance is characterized by three defining features: (a) coexperienced positive emotions, (b) caring nonverbal synchrony, and (c) biological synchrony. First, the theory posits that the advantages linked to individually experienced positive emotions are amplified when positive emotions are coexperienced (Fredrickson, 2016). For instance, in contrast to individually experienced positive emotions, research shows that when positive experiences are coexperienced with others, individuals report more intense positive emotions (Boothby et al., 2014; Brown et al., 2022). Second, caring nonverbal synchrony involves movements and gestures that convey affiliation, including affirmative head nods, Duchenne smiles, nonhostile hand gestures toward the other(s), and leaning toward the other(s). These affiliation cues are vital aspects of coexpressed positive emotions, conveying consideration and partner responsiveness (Reis et al., 2004). In support, a meta-analysis based on experimental manipulations (k = 24) showed that synchronous movements and vocalizations increase the frequency of positive emotions (Mogan et al., 2017). Third, positive emotions can be shared at a biological level, resulting in biological synchrony across different response systems (e.g., neural, biochemical, physiological). For example, research shows that physiological synchrony is most robust between relationship partners during coexperienced positive emotions compared to coexperienced negative emotions and individually experienced emotions (Chen et al., 2021).

Drawing on a rich, longitudinal study of middle-aged and older long-term married couples (e.g., Levenson et al., 1993), positivity resonance was originally studied in a laboratory-based context using a multimodal approach to capture each of these three features (e.g., Wells et al., 2022). In the baseline session, dyads were videotaped using partially obstructed cameras while engaging in three conversational interactions focused on disagreement, neutral, and positive topics. Both partners reported feeling positive emotions concurrently at approximately 29%, 58%, and 74% of the time for disagreement, neutral, and positive topics, respectively. Further findings have shown that higher coexperienced positive emotions were associated with higher relationship satisfaction (Brown et al., 2022), that moments of caring nonverbal synchrony were associated with more coexperienced positive emotions and higher relationship satisfaction (Otero et al., 2020), and that coexperienced positive emotions were associated with greater physiological linkage, which in turn were associated with greater marital satisfaction (Chen et al., 2021). Furthermore, longitudinal research shows that couples with higher positivity resonance experienced diminished declines in health over 13 years and increased longevity over 30 years (Wells et al., 2022).

Other work has focused on developing assessments to capture perceived positivity resonance using end-of-day reports within intensive measurement designs (e.g., Major et al., 2018; Oravecz et al., 2020). For example, using the Day Reconstruction Method, which relies on reconstructive memory of retrospective accounts, participants reported on their interpersonal interactions with all other people (including family, friends, neighbors, colleagues, and strangers) during the day (Major et al., 2018). Relative to the amount of time spent interacting with all other people, items probed the amount of that time (from 0% to 100%) that they attuned to or felt in sync with others. Based on a sample of adults (N = 175; age range = 34–65 years), self-reported perceived positivity resonance amounted to approximately 66% of the time relative to all interpersonal interactions, on average, and also related to fewer illness symptoms (Major et al., 2018). However, this approach focuses on an *individual's* perception of positivity resonance within interpersonal interactions, rather than aiming to capture the extent to which *dyads* coexperience positive emotions.

To summarize, laboratory-based research investigating dyadic interactions between relationship partners demonstrates that positivity resonance can be conceptualized as coexperienced positive emotions, caring nonverbal synchrony, and biological synchrony. These features of positivity resonance, which have been considered separately (e.g., Brown et al., 2022) and collectively (e.g., Wells et al., 2022), are concurrently and longitudinally associated with better distal health outcomes. Further, individual assessments of perceived positivity resonance in daily contexts, as well as its correlates with health outcomes (Major et al., 2018; Oravecz et al., 2020), provide an important foundation for investigating coexperienced positive emotions in daily life. However, capturing momentary coexperienced positive emotions between two or more individuals in daily life is challenging, given limited interpersonal interactions between any two individuals. Focusing on relationships in later life has proven particularly useful for understanding positivity resonance and its health outcomes (e.g., Haase, 2023; Wells et al., 2022).

Positive Emotions and Health in Late-Life Couples

Intimate relationships play a central role in the lives of many people, and decades of research document the importance of relationships for markers of physical health across the lifespan (e.g., Chopik, 2017; Farrell et al., 2023; Robles & Kiecolt-Glaser, 2003; Yang et al., 2016). The relationship with a spouse or cohabiting partner in late life is one context in which relationships have critical implications for health outcomes (Robles & Kiecolt-Glaser, 2003). Specifically, intimate relationships take center stage as older adults tend to become increasingly selective in their relationships (Carstensen et al., 1999; Charles, 2010), are more likely to spend time with their closest ties including partners rather than with distal ties such as acquaintances (Charles & Carstensen, 2007), and are less likely to divorce or separate (Verstaen et al., 2020).

Positive emotions play an important role in late-life physiological functioning, and their soothing functions may, in fact, be one

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mechanism that renders them so important in late life—a context where loss, decline, and threat abound (Haase, 2023; Levenson et al., 2014). Consistent with the undoing effect of positive emotions, laboratory research focused on middle-aged and older couples has shown that relationship partners demonstrated increases in positive emotions during periods of physiological downregulation (Yuan et al., 2010). While a large body of work has probed older adults' physiological reactivity in laboratory-based settings (Uchino et al., 2010), far fewer studies have examined positive emotions and physiological responding in naturalistic, daily contexts. However, recent intensive measurement research shows that older adults have lower heart rate and blood pressure reactivity on occasions when they experienced positive emotions (Park et al., 2023). Thus, broad associations between marital quality and health outcomes are well-documented (see Robles et al., 2014), intimate relationships often become increasingly important and of higher quality in late life (Charles, 2010; Fingerman & Charles, 2010), older adults tend to experience more positive emotions than younger adults (e.g., Carstensen et al., 2011), and positive emotions play an important role in late-life physiological functioning (e.g., Chen et al., 2021; Park et al., 2023; Yuan et al., 2010).

Research documenting the importance of positivity resonance for distal health and longevity outcomes over 30 years in late life (Wells et al., 2022) in turn raises the critical question of whether and how *shared* positive emotions in older relationship partners are linked with proximal physiological health outcomes in daily contexts. Here, we focus on the links between coexperienced positive emotions in the daily lives of older relationship partners and hypothalamic–pituitary–adrenal (HPA) axis activation, a vital predictor of health outcomes (Adam et al., 2017).

Coexperienced Positive Emotions and Cortisol in Late-Life Couples

As a product of HPA axis activation (Papadimitriou & Priftis, 2009), cortisol is a crucial hormone in the human stress response (Gaffey et al., 2016). Secretion of cortisol characteristically follows a diurnal rhythm, distinguished by a steep increase upon awakening, peaking after approximately 30 min, and declining gradually across the remainder of the day (Otte et al., 2005). In healthy individuals, cortisol levels also rise in response to acute stressors (Dickerson & Kemeny, 2004; Hoyt et al., 2016), particularly in the context of social stress (Zoccola et al., 2025). Conversely, atypical cortisol rhythms, characterized by flatter increases and declines or by chronically elevated cortisol levels, are associated with poorer physical and mental health outcomes (Adam et al., 2017; Wrosch et al., 2008). Further, area under the curve with respect to ground (AUC_g), an indicator of overall cortisol output over a given period (e.g., over a day), tends to be associated with adverse health outcomes; for example, research suggests that higher AUC_g is associated with more functional limitations and higher markers of inflammation (DeSantis et al., 2012; Piazza et al., 2018), though there is some conflicting evidence (e.g., Lasikiewicz et al., 2008).

By focusing on factors that may contribute to systematic variation in cortisol secretion, such as emotional experiences, research may be able to identify ways by which individuals can shape their own trajectories of health. For example, the existing literature documents that several subjective-emotional responses covary with momentary elevations or reductions in cortisol (see Schlotz, 2019). Notably, positive emotions are related to lower momentary cortisol at the within-person level (see Joseph et al., 2021).

The links between positive emotions and cortisol secretion may be magnified in older adulthood, as research shows age-related differences in emotional experience (e.g., evidence consistent with strength and vulnerability integration theory; Charles, 2010) and in physiological flexibility and reactivity. A systematic review and meta-analysis synthesizing experimental studies ($K = 45$) found that older adults showed more intense cortisol responses to laboratory-based challenge tasks compared to younger adults (Otte et al., 2005). Likewise, the existing empirical research provides compelling evidence that flatter diurnal cortisol slopes (atypical diurnal cortisol rhythms) are associated with poorer health outcomes in adulthood compared to childhood (Adam et al., 2017). Moreover, research shows that older adults tend to have flatter daily cortisol slopes and greater daily cortisol output (i.e., AUC_g) compared to younger adults (Almeida et al., 2020). Thus, given age-related differences in the links between emotional experiences and physiological responding, late-life couples may be the ideal population for studying coexperienced positive emotions and cortisol secretion.

Taken together, although research consistently documents the importance of individually experienced positive emotions, the proximal physiological correlates of coexperienced positive emotions in daily life remain poorly understood. Both theory and empirical research suggest that late-life relationships may be an ideal testing ground to investigate the extent to which coexperienced positive emotions get "under the skin."

The Present Research

This research extends previous work by investigating (a) whether we could capture coexperienced positive emotions between older relationship partners in daily life and (b) whether coexperienced positive emotions were related to lower momentary cortisol. To address these research aims, we harmonized data from three intensive measurement data sets with a total of 321 long-term cohabitating older relationship partners (i.e., 642 individuals). Our approach to capturing positivity resonance is consistent with, and extends beyond, the existing literature in four important ways. First, by drawing on up to 5–7 self-report assessments per day for seven consecutive days, our approach maximizes ecological validity (Wilhelm & Grossman, 2010) and minimizes reliance on retrospective memory. Accordingly, rather than relying on the Day Reconstruction Method which encourages participants to reflect on experiences at the end of day and may distort the accuracy and reliability of self-report (i.e., recall bias), we investigated positive emotions at, or close to, the moments that these emotions occurred. Second, building upon previous work evaluating perceived positivity resonance in the daily lives of individuals, we extend to coexperienced positive emotions in the daily lives of dyads. Third, we focus on a particularly salient relationship for older adults—the relationship with a cohabiting partner, which provides an ideal set of circumstances for investigating whether coexperienced positive emotions can be captured between two individuals in daily life. Compared to younger relationship partners, older relationship partners are more likely to spend more of the day together due to age-related changes in responsibilities (e.g., retirement) and contextual factors (e.g., more opportunities for togetherness; Thulin et al., 2022). Finally, in addition to investigating whether coexperienced positive emotions can be captured in daily

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contexts, we sought to examine the extent to which coexperienced positive emotions are linked with markers of physiological responses, specifically momentary cortisol levels.

Building upon the existing literature, we had the following two hypotheses. First, we adopted a relatively conservative approach, predicting that we would detect coexperienced positive emotions between relationship partners frequently in daily contexts (29%–74% of the time based on previous studies; Brown et al., 2022; Major et al., 2018). Second, based on theory and evidence suggesting that coexperienced positive emotions are (a) associated with greater physiological synchrony (Chen et al., 2021) and (b) carry additional variance as an indicator of health and longevity compared to individually experienced positive emotions (Fredrickson, 2016; Wells et al., 2022), we hypothesized that momentary cortisol would be lower in moments when dyads coexperienced positive emotions, adjusting for individually experienced positive emotions. Given the diurnal rhythm of cortisol secretion (Otte et al., 2005), all models accounted for linear and quadratic time since waking, as well as several time-varying covariates such as medication or caffeine use that would impact momentary cortisol levels (Kudielka et al., 2012). Moreover, analyses adjusted for age and sex differences given that these variables have been previously shown to influence both affective states and cortisol level (e.g., Haase, 2023; Van Cauter et al., 1996). To probe generalizability, we also examined whether associations between coexperienced positive emotions and momentary cortisol were moderated by age, sex, and relationship satisfaction. Finally, to probe directionality, we examined links between coexperienced positive emotions and momentary cortisol using a time-lagged approach. This approach allowed us to analyze the temporal interplay between positivity resonance and momentary cortisol, a critical question in research on positive emotions and health (e.g., Steptoe, 2019).

Method

Data for the current analyses were obtained from three independent intensive measurement design (Rast et al., 2012) studies of community-residing older cohabiting partners from Canada and Germany. In all three studies, participants were recruited and completed study participation prior to the COVID-19 pandemic (i.e., between 2012 and 2018).

Studies and Procedure

In all three studies, participants provided background and demographic information at baseline, followed by short, electronic surveys 5–7 times per day for seven consecutive days. The combined data included 23,931 reports obtained from 321 couples (642 individuals).[1] Relationship partners independently and simultaneously completed surveys on password-protected tablets and were asked not to share their responses with one another. The first surveys of the day were completed immediately upon waking, and each participant was prompted for the subsequent surveys across the remainder of the day. All three studies aimed to recruit older adults who were approximately 60 years or older and were cohabiting (married or common law). Further, to be eligible, both relationship partners had to be willing to participate in the study, and neither could have any reading or hearing impairments that could interfere with using an iPad or hearing the prompt alarms. Participants were also ineligible if they reported any condition for which exercise was contradicted or if they were diagnosed with a neurodegenerative disease (e.g., Alzheimer's or Parkinson's) that would limit completing surveys on tablets. Participants were ineligible if they had hyperthyroidism or hypothyroidism; in addition to relying on self-reported diagnoses, participants were excluded based on implausible cortisol levels.

Study 1 data were provided by 85 older mixed-sex couples aged 60–87 years who were recruited in 2016–2017 in Vancouver, Canada (M_{age} = 71.0, SD = 6.2, range = 60–86; 89% retired; 58.9% White, 36.9% East Asian). The study was available in both English and Mandarin languages to accommodate Vancouver's demographics, with 29.8% of couples opting for the Mandarin version. The study aimed to recruit community-residing adults 60 years or older, who were fluent in English or Mandarin and living with a long-term relationship partner (married or common law). Participants provided saliva samples and completed electronic surveys up to five times per day (at waking, 30 min after waking, and at 11 a.m., 4 p.m., and 9 p.m.). Adherence was high (91% completion), and each participant was reimbursed $100 CAD for their participation.

Study 2 data were provided by 77 older couples aged 66–85 years recruited in 2012–2013 in Berlin, Germany (M_{age} = 74.1, SD = 3.6, range = 66–85; 49% female; 99% mixed-sex; 93% retired; 98% reported German as their first language), with very high adherence (98% completion).

Study 3 data were provided by 159 older mixed-sex couples aged 56–89 years recruited in 2016–2018 from the German Socio-Economic Panel (Goebel et al., 2019; M_{age} = 72.2, SD = 5.8, range = 56–87; 96% reported German as their first language).

In both Study 2 and Study 3, participants were required to be fluent in German, and both studies recruited couples originating from East and West Germany who grew up under diverse circumstances (e.g., communism). Participants were prompted to provide saliva samples and complete short electronic surveys up to seven times per day (at waking, 30 min after waking, and at 10 a.m., 1 p.m., 4 p.m., 7 p.m., and 9:30 p.m.). Each participant was reimbursed up to $100 EUR for their participation.

Measures

The three substudies included several assessments at baseline measuring individual differences. Our secondary data analysis used the following measures to answer the present research questions.

Positive Emotions

At each short electronic survey, participants' current perceived positive emotions were measured using eight items adapted from Tsai et al. (2006). Participants reported their current emotional state on a sliding scale from 0 (*not at all*) to 100 (*very much*). Given differences in items that were administered across the three studies, we focused on positive emotion items that were consistent across all three studies: *happy*, *interested*, and *relaxed*. We computed the mean of positive emotion items at each assessment to create an

[1] Given that this was a secondary data analysis, the sample size was determined by the available data across these three harmonized data sets. The sample size is comparable to or larger than those used in previous studies examining similar constructs (e.g., N = 150 couples, Brown et al., 2022; N = 154 couples, Wells et al., 2022).

individual momentary positive emotion score. Reliability estimates of the emotion scales were computed based on generalizability theory, using an approach developed by Cranford et al. (2006). Reliability for detecting within-person change in positive emotions from one observation to the next was moderate ($R_C = 0.64$), while reliability of the averaged score at the person level across occasions was relatively consistent ($R_{kf} = 0.73$). Two positive emotion variables were included in analyses: one time-varying variable centered on each participant's mean value and a person-level variable reflecting each person's mean positive emotion score centered on the overall sample mean (positive emotion P_{mean}).

Coexperienced Positive Emotions

Positive emotion assessments were within-person centered for each individual, with values above 0 indicating that participants were experiencing higher positive emotions than were typical for them during the study period. Based on these within-person centered emotion assessments, we created a dichotomous variable in which couples were assigned a score of 1 if they reported being together in the same space and both reported higher positive emotions than their own mean levels (i.e., 0 = *together, but both did not report higher positive emotions compared to their own mean levels*). Thus, occasions when participants were not together were treated as missing. An additional variable was computed from this score reflecting each couple's mean number of occasions in which they coexperienced positive emotions relative to the sample mean to adjust for between-couple differences (coexperienced positive emotion C_{mean}).

Cortisol

Participants provided saliva samples up to five (Study 1) or seven (Studies 2 and 3) times per day using Salivettes (Sarstedt, Germany) at 2- to 5-hr intervals during waking hours. Participants were instructed to store saliva samples in their fridge or freezer until they were collected by research personnel. Upon collection, samples were stored and frozen (−18 °C to −31 °C) at the respective universities until they were sent to Dresden LabService GmbH in Germany for assaying. Cortisol samples were centrifuged at 3,000 rpm for 5 min prior to thawing. Then, assaying was completed using a commercially available chemiluminescence immunoassay with high sensitivity (IBL International, Hamburg, Germany). The lower limit of assay sensitivity was 0.11 nmol/L, and both inter-assay and intra-assay variations were below 9%.

In the period between when Study 2 and Study 3 data were collected, IBL International recalibrated their chemiluminescence immunoassay to ensure comparability to absolute concentrations as obtained by liquid chromatography/simultaneous mass spectrometry. Cortisol concentrations identified by the old and recalibrated immunoassay were highly correlated ($r > .95$); however, recalibration resulted in lower absolute cortisol concentrations in Study 3, compared to Studies 1 and 2. To account for these differences, cortisol values were transformed using formulas provided by Miller et al. (2013) and assay version was included as a person-level covariate in the models. Consistent with recommendations (Wilcox, 2010), extreme outliers (higher or lower than 3 *SD*s from the mean at each occasion) were Winsorized; specifically, values lower than 3 *SD*s from the mean were replaced by the −3 *SD* value and values higher than 3 *SD*s from the mean were replaced by the +3 *SD* value. Cortisol values were expressed in nmol/L ($M = 8.23$ nmol/L, $SD = 3.78$, range = 0.23–28.23). Samples were excluded from analyses if participants provided an incomplete sample.

Relationship Satisfaction

Relationship satisfaction was assessed once using a single item from the Relationship Assessment Scale: "In general, how satisfied are you with your relationship?" (Hendrick, 1988). Response options ranged from 1 (*not at all*) to 5 (*very much*; $M = 3.39$, $SD = 0.71$).

Behaviors That May Affect Cortisol Levels

To account for potential time-varying influences on cortisol secretion, models also adjusted for several momentary variables at the occasion level that may increase or decrease cortisol (Kudielka et al., 2012). Specifically, at each cortisol assessment, participants were asked whether they had done any of the following since waking or since the previous survey (1 = *yes*, 0 = *no*): taking medication(s); consuming food, alcohol, or caffeine; smoking; taking a cold shower; brushing teeth; and engaging in physical activity proximal to providing their saliva sample.

Data Analytic Strategy

Multilevel modeling analyses were used to examine changes in daily cortisol patterns. As the focus of this project was coexperienced emotions, only occasions in which relationship partners were together were selected for our analyses (71% of possible occasions). We estimated three-level models with measurement occasions nested within persons, nested within couples. These models were selected as the most parsimonious model relative to a four-level model accounting for day in study, as there was 0% variability at the day level after adjusting for diurnal rhythm. Although there was no variability in the predictor (i.e., coexperienced positive emotions) at the within-couple level, the intraclass correlation coefficient indicated that 96.76% of the variability in coexperiencing positive emotions occurred within persons, and the remaining 3.24% occurred at the between-couple level. Further, there was variability in the outcome (i.e., cortisol) at all three levels (82.66% within persons, 9.61% between persons within couples, and 7.73% between couples).

To account for cortisol's diurnal trajectory, log-transformed momentary cortisol was modeled as a function of time since waking (in hours), as well as quadratic time since waking. In addition to adjusting for diurnal rhythm, models adjusted for momentary behaviors that might affect cortisol and person-mean centered positive emotion scores at the occasion level, to investigate the extent to which coexperienced positive emotions are related to momentary cortisol beyond individually experienced positive emotions. At the person level, participant age in years at baseline, self-reported biological sex, cortisol assay version, and partners' mean positive emotions were included as person-level covariates to adjust for sample heterogeneity. To facilitate model convergence, positive emotion scores were divided by 100 so that they were on a 0–1 scale (as opposed to the raw 0–100 scale). Models were built up sequentially, beginning with an initial model (Model 1) including

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the time-invariant (i.e., person-level) and time-varying (i.e., occasion-level) covariates. The equation for Model 1 used the following structure:

$$\begin{aligned}\text{Level 1: } \log \text{Cortisol}_{ijk} = {} & \pi_{0ik} + \pi_{1ik}(\text{tsw}_{ijk}) + \pi_{2ik}(\text{tsw}^2_{ijk}) \\ & + \pi_{3ik}(\text{Food}_{ijk}) + \pi_{4ik}(\text{Caffeine}_{ijk}) \\ & + \pi_{5ik}(\text{PA}_{ijk}) + \pi_{6ik}(\text{Shower}_{ijk}) \\ & + \pi_{7ik}(\text{Alcohol}_{ijk}) + \pi_{8ik}(\text{Medication}_{ijk}) \\ & + \pi_{9ik}(\text{Nicotine}_{ijk}) + e_{ijk}, \end{aligned} \quad (1)$$

$$\begin{aligned}\text{Level 2: } \pi_{0ij} &= \beta_{00i} + \beta_{01i}(\text{Age}_{ij}) + \beta_{02i}(\text{Sex}_{ij}) + \beta_{03i}(\text{Assay}_{ij}) + r_{0ij} \\ \pi_{1ij} &= \beta_{10i} + r_{1ij} \\ \pi_{2ij} &= \beta_{20i} + r_{2ij}, \end{aligned} \quad (2)$$

$$\text{Level 3: } \beta_{00i} = \gamma_{000} + u_{00i}. \quad (3)$$

At the within-person level (Equation 1), log-transformed cortisol measured on occasion k for person j in couple i ($\log\text{Cortisol}_{ijk}$) was regressed on time since waking (tsw, in hours), time since waking squared (tsw^2), and the time-varying covariates of food, caffeine, physical activity (PA), having a cold shower or brushing teeth (Shower), alcohol, medication, and nicotine (all binary variables, indicating the presence [1] or absence [0] of each activity since waking or since the previous survey). At the between-person level (Equation 2), π_{0ij} represents the average cortisol level for each person j within each couple i, predicted by age (centered on the sample mean) and sex (*female* = 0, *male* = 1), as well as assay version (0 = *older version*, 1 = *recalibrated version*). The linear and quadratic effects of time were allowed to vary between participants. The Level 2 and Level 3 covariate effects were not included in the above formula for parsimony but were estimated as fixed effects ($\pi_{nij} = \beta_{n0i}$ for Level 2 and $\beta_{n0i} = \gamma_{n0i}$ for Level 3) where n is the parameter number ranging from 3 (*food*) to 9 (*nicotine*). At the couple level (Equation 3), mean cortisol levels were allowed to vary between couples.

Model 2 built upon this by adjusting for participants' mean positive affect scores and those of their partner as covariates at the person level (Level 2). Model 3 further included coexperienced positive emotions (0 = *moments when partners were together, but both did not report higher positive emotions compared to their personal average*; 1 = *moments when partners were together and both reported higher positive emotions compared to their personal average*) as an additional time-varying predictor of cortisol. Additionally, these models adjusted for couple-mean centered coexperienced positive emotion scores to account for between-couple differences in frequency of coexperienced positive emotions. Based on Model 3, we examined the effect of coexperienced positive emotions for each unique positive emotion (i.e., for happy, relaxed, and interested) as a series of sensitivity analyses.

Models 4, 5, and 6 examined age, sex, and relationship satisfaction as moderators by adding cross-level interaction terms between each of these person-level variables and the time-varying coexperienced positive emotions variable. Although we are not able to determine causation based on observational data, we were interested in exploring the directionality of the links between coexperienced positive emotions and momentary cortisol. Therefore, additional exploratory analyses examined the lagged effects of coexperienced positive emotions on cortisol and of cortisol on positive emotions (Models 7 and 8). These lagged-effects models included a dichotomous covariate ("Overnight") to distinguish within-day versus overnight transitions given established diurnal cortisol patterns and interday differences that may occur in positive emotions.

All models were estimated in R (R Core Team, 2013) using restricted maximum likelihood estimation with the lme4 package (Bates et al., 2014). Effect sizes were computed for each predictor in the multilevel models using the proportional reduction in variance approach (Peugh, 2010; Raudenbush, 2002). This represents the proportional reduction in variance explained for a model with this effect compared to one without, expressed as a proportion of the variance at that corresponding level of analysis.

Transparency and Openness

These studies were approved by the institutional governing ethics review boards (Study 1 by the University of British Columbia, Protocol No. H12-01854; Study 2 and Study 3 by Humboldt University, Protocol No. 2013-15), and all participants provided written informed consent. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. These data have been used in previous publications. For example, previous work by a subset of the authors has used at least one of these studies to investigate individually experienced emotions and cortisol, both within individuals (Pauly, Drewelies, et al., 2021) and within couples (Kolodziejczak et al., 2022; Michalowski et al., 2021; Yoneda et al., 2024). However, the current research represents the first time that we have investigated *coexperienced* positive emotions using these data. See Supplemental Table S1 for a full list of previous publications using these data sets. This research was not preregistered; however, the analytical code to prepare and analyze the data is available on the Open Science Framework (https://osf.io/wcztv/files/osfstorage). This repository also contains the project protocol and relevant variables for Study 1, as well as the daily diary protocol for Studies 2 and 3. Analytic methods and program packages are appropriately cited in the text and listed in the reference section. Data for these studies cannot be openly shared due to containing information that could compromise research participants' privacy and consent. This concern is particularly heightened with family data, where the ability to identify one's own data may inadvertently expose the privacy of other family or dyad members (Stine-Morrow, 2022).

Results

Descriptive Characteristics

Descriptive statistics for the three studies and overall sample are presented in Table 1. Most participants were from mixed-sex couples, with the exception of one same-sex couple from Study 2. The overall sample included 23,931 measurements from 642 participants, of which participants reported being with their romantic partner on 71.27% of occasions (17,056). A bivariate correlation matrix for all study variables is shown in Supplemental Figure S1 (all correlation values were small to moderate, ranging from −0.200 to 0.515). Further, to test for potential multicollinearity, we used the check_collinearity() function from the performance package (Lüdecke et al., 2021) in R, which provides variance inflation factors, where values less than 5 indicate that multicollinearity is not

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Table 1
Descriptive Characteristics Across Data Sets and Overall

Variable	Study 1	Study 2	Study 3	Overall
n	170	154	318	642
Occasions with partner	3,480 (78.15%)	4,860 (76.32%)	8,716 (66.48%)	17,056 (71.27%)
Age	71.18 (6.05)	74.36 (3.38)	72.29 (5.85)	72.49 (5.53)
Female sex	85 (50.00%)	76 (49.35%)	159 (50.00%)	320 (49.84%)
Postsecondary education	63 (37.06%)	59 (38.31%)	50 (15.72%)	172 (26.79%)
Relationship length (years)	40.54 (13.56)	46.45 (13.22)	47.29 (11.68)	45.26 (12.90)
Cortisol, $\log_{10}$	0.89 (0.14)	0.84 (0.13)	0.56 (0.17)	0.72 (0.22)
Coexperienced positive emotions	1,169 (33.59%)	1,895 (38.99%)	3,442 (39.49)	6,506 (38.14%)
Positive emotions	72.12 (12.68)	68.41 (12.81)	68.12 (13.61)	69.25 (13.27)

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a substantial concern. For Model 3, all Level 1 covariates had variance inflation factors below 5 (range = 1.02–1.33), suggesting a low likelihood of issues arising from multicollinearity.

Coexperienced Positive Emotions

The first aim of the present study was to investigate the frequency of coexperienced positive emotions between older relationship partners in daily life. Based on theory and lab-based evidence, we anticipated that relationship partners would coexperience positive emotions in daily contexts quite frequently, likely in the range between 29% and 74% of the time. On occasions where dyads were together, both relationship partners coexperienced positive emotions beyond their personal average 38% of the time (range = 0%–73%). Participants exhibited similar rates of coexperiencing the individual positive emotions of *happy*, *interested*, and *relaxed* (see Table 2).

Concurrent Momentary Associations Between Positivity Resonance and Cortisol

To address Aim 2, we hypothesized that coexperienced positive emotions would be associated with lower momentary cortisol levels. Results from the multilevel models are displayed in Table 3. Models showed that coexperienced positive emotions were associated with lower concurrent cortisol levels (see Figure 1). On average, participants had 1.03 nmol/L less cortisol on occasions when they were experiencing shared elevated levels of positive emotions with their romantic partner. Adding coexperienced positive emotions to the model resulted in a half percentage reduction in the total variance in log-transformed cortisol at the momentary level. There was no significant between-couple effect of coexperienced positive emotions, such that couples who coexperienced more overall positive emotions over the study period did not differ in cortisol relative to couples with less frequent coexperienced positive emotions. One's own mean level of positive emotions was negatively associated with cortisol, such that each 1-unit increase in mean positive emotions was associated with 1.12 nmol/L decrease in cortisol levels across the study period. Partner's mean positive emotions did not predict differences in cortisol.

We also fit a series of sensitivity analyses focusing on the effects of each unique positive emotion (happy, relaxed, and interested). Results from the multilevel models are displayed in Supplemental Table S2. Results show that coexperienced *happiness* ($b = -0.016$, $SE = 0.0049$, $p = .002$) and *relaxation* ($b = -0.012$, $SE = 0.0054$, $p = .026$) were associated with lower concurrent cortisol levels, but that coexperienced *interest* was not ($b = -0.0073$, $SE = 0.0055$, $p = .186$).

Table 2
Coexperienced Positive Emotions Across Emotion Types

Positive emotion	*N*	%
Happy	5,784/14,060	41.14
Interested	5,198/14,060	36.97
Relaxed	6,002/14,060	42.69
Overall positive emotions	6,506/17,056	38.14

The Role of Age, Sex, and Relationship Satisfaction

Additional models were run to consider potential moderation of the coexperienced positive emotions effect by age, sex, and relationship satisfaction. Supplemental Table S3 displays results from Models 4–6, which include interactions between coexperienced positive emotions and each of these variables, respectively. No significant moderation effect was observed across any of these models, suggesting that the impact of coexperiencing positive emotions on cortisol did not differ across age, sex, and relationship satisfaction in the present sample.

Lagged Associations Between Coexperienced Positive Emotions and Cortisol

Finally, to tease apart the temporal ordering of these effects, exploratory models examined the temporal sequence of coexperienced positive emotions and cortisol using lagged-effects models. The first of these multilevel models included coexperienced positive emotions from the previous occasion as a predictor of current cortisol levels, and the second included previous cortisol levels as a predictor of current coexperienced positive emotions. Both models additionally adjusted for whether the lagged effect occurred overnight or within day to account for the longer time interval between assessments and potentially large overnight changes typically seen with diurnal cortisol rhythms. Results suggest that higher coexperienced positive emotions were associated with lower cortisol at the subsequent assessment, suggesting potentially enduring physiological impacts of coexperienced positive emotions beyond the present moment (see Supplemental Tables S4 and S5). However, the reverse did not appear to be true; specifically, there was no significant

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Table 3

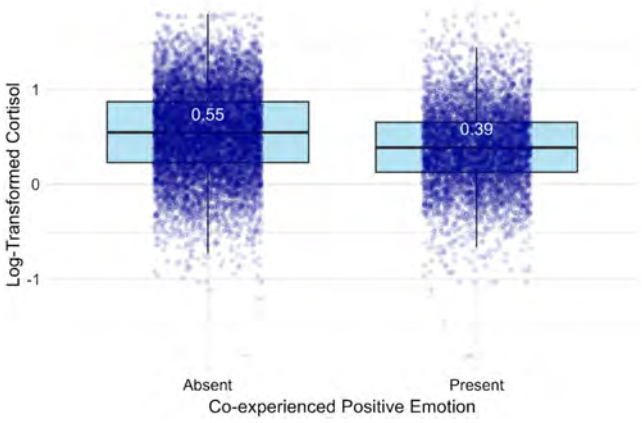
Results From Multilevel Models Examining Momentary Cortisol (log_{10} nmol/L) Using Restricted Maximum Likelihood Estimation

Variable	Model 1			Model 2			Model 3			
	b (*SE*)	95% CI	*p*	*b* (*SE*)	95% CI	*p*	*b* (*SE*)	95% CI	*p*	PRV
Intercept	0.438 (0.013)	[0.41, 0.46]	<.001	0.439 (0.013)	[0.41, 0.46]	<.001	0.445 (0.028)	[0.39, 0.50]	<.001	
Time since waking	−0.077 (0.0015)	[−0.080, −0.074]	<.001	−0.076 (0.0016)	[−0.079, −0.073]	<.001	−0.076 (0.0016)	[−0.079, −0.073]	<.001	0.13
Time since waking^2	0.0010 (0.00010)	[0.00084, 0.0012]	<.001	0.0010 (0.00010)	[0.0080, 0.0012]	<.001	0.0010 (0.00010)	[0.00078, 0.0012]	<.001	0.0061
Age	0.0039 (0.0014)	[0.0011, 0.0066]	.005	0.0037 (0.0014)	[0.0010, 0.0064]	.006	0.0036 (0.0014)	[0.00091, 0.0063]	.008	0.025
Sex	−0.035 (0.012)	[−0.059, −0.012]	.003	−0.038 (0.012)	[−0.062, −0.014]	.002	−0.037 (0.013)	[−0.061, −0.013]	.002	0.018
Assay version	0.162 (0.016)	[0.13, 0.19]	<.001	0.162 (0.016)	[0.13, 0.19]	<.001	0.163 (0.016)	[0.13, 0.19]	<.001	0.43
Food	0.016 (0.0048)	[0.0063, 0.025]	<.001	0.016 (0.0048)	[0.0072, 0.026]	<.001	0.016 (0.0048)	[0.0069, 0.026]	<.001	0.00072
Caffeine	−0.0075 (0.0058)	[−0.019, 0.0039]	.198	−0.0070 (0.0058)	[−0.018, 0.0044]	.228	−0.0072 (0.0058)	[−0.19, 0.0042]	.217	<0.0001
Physical activity	−0.024 (0.0080)	[−0.040, −0.0088]	.002	−0.024 (0.0080)	[−0.040, −0.0087]	.002	−0.024 (0.0081)	[−0.040, −0.0083]	.003	0.00067
Shower/brushed teeth	−0.031 (0.0072)	[−0.045, −0.016]	<.001	−0.029 (0.0072)	[−0.043, −0.015]	<.001	−0.029 (0.0072)	[−0.044, −0.015]	<.001	<0.0001
Alcohol	−0.029 (0.0081)	[−0.045, −0.013]	<.001	−0.028 (0.0081)	[−0.044, −0.012]	<.001	−0.027 (0.0083)	[−0.044, −0.011]	<.001	0.00061
Medication	−0.017 (0.0063)	[−0.029, −0.0047]	.007	−0.018 (0.0063)	[−0.030, −0.0052]	.005	−0.016 (0.0063)	[−0.028, −0.0032]	.013	0.00040
Nicotine	0.041 (0.020)	[0.0022, 0.081]	.039	0.038 (0.020)	[−0.00099, 0.078]	.056	0.038 (0.020)	[−0.0015, 0.080]	.060	<0.0001
Positive emotions (time-varying)				−0.072 (0.019)	[−0.11, −0.034]	<.001	−0.048 (0.021)	[−0.089, −0.0066]	.023	0.012
Positive emotions P_{mean}				−0.031 (0.054)	[−0.14, 0.073]	.536	−0.029 (0.056)	[−0.14, 0.080]	.602	<0.0001
Coexperienced positive emotions (time-varying)							−0.013 (0.0054)	[−0.023, −0.0022]	.018	0.0054
Coexperienced positive emotion C_{mean}							−0.0071 (0.069)	[−0.14, 0.13]	.919	<0.0001
Variance components										
Residual	0.064 (0.252)			0.063 (0.250)			0.062 (0.250)			
Person intercept	0.018 (0.135)			0.018 (0.135)			0.018 (0.136)			
Couple intercept	0.0088 (0.094)			0.0088 (0.094)			0.0089 (0.094)			
Model fit										
Degrees of freedom	16			20			24			
Log likelihood	−1531.104			−1501.963			−1476.365			

Note. $N = 321$ couples. Coexperienced positive emotions are occasions in which both relationship partners reported higher positive emotions compared to their personal average. *SE* = standard error; 95% CI = 95% confidence interval; PRV = proportional reduction in variance; P_{mean} = person-level mean; C_{mean} = couple-level mean.

Figure 1

Differences Between Log-Transformed Momentary Cortisol When Coexperienced Positive Emotions Were Absent or Present



Note. Each blue dot represents a cortisol measurement. The dark horizontal line in the center of the boxplot represents the median log cortisol values, the box represents the interquartile range, and the vertical whisker lines represent 1.5 times the interquartile range above and below the first and third quartiles. See the online article for the color version of this figure.

relationship between cortisol levels and the likelihood of coexperiencing positive emotions at the following assessment.

Discussion

Building upon and extending the existing theory and empirical research (Brown et al., 2022; Chen et al., 2021; Fredrickson, 2000, 2004, 2016; Fredrickson et al., 2000; Major et al., 2018; Wells et al., 2022), this project investigated the extent to which we could capture coexperienced positive emotions in the daily lives of older couples (N_{total} = 321) and whether coexperienced positive emotions would be linked with momentary cortisol secretion. To our knowledge, this is the first study examining positivity resonance in daily life. Our findings show that relationship partners reported positive emotions higher than their usual at more than a third of occasions of their time spent together. Further, our findings show that coexperienced positive emotions were associated with lower momentary cortisol secretion, over and above individually experienced positive emotions, and that this effect generalized across age, sex, and relationship satisfaction (though the sample comprised couples who reported high relationship satisfaction, on average). Finally, teasing apart the temporal ordering of these associations, findings show that coexperienced positive emotions were linked with lower cortisol secretion at the following occasion suggesting a short-term temporal effect of shared positive emotions on cortisol levels, while cortisol secretion was unrelated to subsequent coexperienced positive emotions.

The Prevalence of Coexperienced Positive Emotions in Daily Life

Drawing on up to 5–7 self-reported assessments per day for seven consecutive days, the present research focused on positive emotions that were coexperienced in the daily lives of older relationship partners. Our results showed that coexperienced positive emotions occurred at approximately 38% of the occasions when relationship partners completed surveys and were together, with slightly different prevalence rates across various positive emotions; both partners reported being *relaxed*, *happier*, and *interested* at 43%, 41%, and 37% of measurement occasions, respectively, compared to their typical levels. These findings are consistent with previously reported positivity resonance prevalence estimates (Brown et al., 2022; Major et al., 2018). Specifically, laboratory-based research focusing on middle-aged and older relationship partners showed that coexperienced positive emotions occurred approximately 29%, 58%, and 74% of the time during prompted disagreement, neutral, and positive interactions, respectively (Brown et al., 2022). Comparably to these laboratory-based prompted interactions, the timing (2- to 5-hr intervals) and frequency (up to 5–7 surveys per day) of our assessments were also likely to capture moments across a wide range of interactions. Importantly, our approach permitted opportunities to capture naturally occurring, unprompted interactions between relationship partners across multiple occasions in daily life, showing that positivity resonance is common in daily life and providing novel and important ecological validity for positivity resonance (Schlotz, 2019; Wilhelm & Grossman, 2010).

Previous intensive measurement research based on end-of-day reports has found that perceived positivity resonance was self-reported at approximately 66% of the time relative to all interpersonal interactions across the day (Major et al., 2018). This perceived positivity resonance scale encourages participants to reflect at the end of the day on all interpersonal interactions with all other people (including family, friends, neighbors, work colleagues, strangers). In contrast, our procedures ensured that coexperienced positive emotions were captured in the moment, although we were limited by our ability to only capture a selection of momentary interactions and only interactions that occurred between romantic relationship partners. While this likely explains why Major et al.'s (2018) estimates are higher than ours, future research should focus on how interactions with other family members, friends, and even strangers (cf. Berman et al., 2024) offer opportunities for positivity resonance in daily life and their downstream health consequences. In tandem with heightened divorce rates, remarrying, and being single by choice, fewer adults are growing old with their first and only spouse (Carr & Utz, 2020). Notably, recent research based on a sample representing the majority of the lifespan (range = 13–77 years) shows that consistent and increasingly positive friendships are linked with better self-rated health (Ajrouch et al., 2024), emphasizing the importance of social relationships beyond spouses. Yet, our findings raise the possibility that positivity resonance between close relationship partners may account for a sizable share of overall positivity resonance in older people's lives—another important question for future research (cf. West & Fredrickson, 2020). Further, in addition to obtaining self-reports from both partners within a couple to capture coexperienced positive emotions, our approach minimized reliance on retrospective memory by assessing participants at several moments throughout the day.

At a descriptive level, prevalence estimates for the three different positive emotions we assessed are interesting in light of extant theory and research on discrete positive emotions (e.g., Cowen & Keltner, 2017; Shiota et al., 2017). Partners coexperienced relaxation on 43% of measurement occasions, happiness on 41% of occasions, and interest on 37% of occasions. Which specific positive

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emotions are particularly likely to be coexperienced, coexpressed, and physiologically shared is an exciting question for future research. Perhaps positive emotions that engage the vagus nerve, which has long been implicated in complex social behavior (Darwin, 1872; Muhtadie et al., 2015; Porges, 2001), such as contentment (Shiota et al., 2017) and compassion (Stellar et al., 2015), are particularly likely to be coexperienced. Or perhaps interpersonal positive emotions, such as love (Fredrickson, 2016) or affection (Meier et al., 2024), or positive emotional behaviors, such as smiles or laughter (not incidentally described as infectious), are particularly likely to be shared between people.

In sum, our work documenting positivity resonance in couples' daily life builds on and extends previous work on positivity resonance in laboratory-based interactions and through end-of-day reports of perceived positivity resonance in important ways and suggests exciting directions for future research.

Coexperienced Positive Emotions Are Associated With Lower Cortisol Secretion

Positivity resonance theory (Fredrickson, 2016) posits that the health benefits linked to individually experienced positive emotions are amplified when positive emotions are shared. While laboratory-based research provides ample evidence in support of this theory (e.g., Boothby et al., 2014; Chen et al., 2021; Mogan et al., 2017; Wells et al., 2022), we are only beginning to understand how these processes unfold in daily life. In the present research, we focused on the associations between momentary coexperienced positive emotions and cortisol secretion. Consistent with positivity resonance theory, our findings show that coexperienced positive emotions are associated with 1.03 nmol/L lower momentary cortisol secretion, over and beyond individually experienced positive emotions. For context, a meta-analysis based on laboratory studies has shown that the Trier Social Stress Test is the most potent activator of cortisol responses to stress (Dickerson & Kemeny, 2004), with existing research showing that, on average, older adults increase just under 2 nmol/L from baseline when exposed to the age-adapted Trier Social Stress Test (Mikneviciute et al., 2023). Thus, our results speak to the importance of social contexts for older adult health and how coexperienced positive emotions may "get under the skin" as an interpersonal protective factor within relationships.

The broaden-and-build theory of positive emotions highlights the physiological soothing quality of positive emotions (Fredrickson, 2004), suggesting that positive emotions may "undo" cardiovascular responses to negative emotions (Fredrickson, 2004; Fredrickson & Levenson, 1998; Levenson, 2003; Yuan et al., 2010). Similarly, the Main Effect Model of Positive Affect and Health (Pressman & Cohen, 2005; Pressman et al., 2019) aims to explain how positive emotions contribute to downstream markers of health. First, the model posits that positive emotions directly influence a range of social factors, health behaviors, and physiological responding, including HPA axis activation. Extensive research provides empirical support for these pathways (e.g., see Joseph et al., 2021; Marsland et al., 2007). Second, the model proposes that these mediating factors contribute to immune and cardiovascular system functioning (e.g., Steptoe et al., 2005; Steptoe & Wardle, 2005), thereby decreasing the risk of disease.

The present research provides evidence at the intersection of these three theories. Consistent with the broaden-and-build theory of positive emotions (Fredrickson, 2004), our findings suggest that one way in which coexperienced positive emotions may be physiologically soothing is by buffering the secretion of cortisol. Thus, our findings that coexperienced positive emotions are linked with lower momentary cortisol secretion may have important implications for downstream health outcomes, consistent with the Main Effect Model of Positive Affect and Health (Pressman & Cohen, 2005; Pressman et al., 2019) and empirical research finding that dysregulated, atypical, and chronic cortisol secretion is an important marker of adverse health outcomes (Adam et al., 2017; Seeman et al., 2010). Future research should explore whether and how the daily dynamics of coexperienced positive emotions and cortisol secretion are related to health-related outcomes using long-term measurement burst designs. Moreover, the present findings show that coexperienced positive emotions are linked with lower cortisol secretion, over and beyond individually experienced positive emotions, providing support for positivity resonance theory (Fredrickson, 2016). Finally, our lagged analyses provide important insights into the directionality of these associations (cf. Steptoe, 2019), showing that coexperienced positive emotions were associated with lower cortisol secretion at the following occasion but that momentary cortisol was not related to proceeding coexperienced positive emotions. These findings suggest that coexperienced positive emotions may be physiologically soothing beyond the present moment, while the reverse does not appear to be true—cortisol levels are not associated with the likelihood of coexperiencing positive emotions at follow-up occasions.

In the present study, we focused on occasions when relationship partners were physically together, involving opportunities for interpersonal connection, closeness, and intimacy. Many psychological theories posit that interpersonal connections and social interaction are basic human needs (e.g., Baumeister & Leary, 1995; Cacioppo & Cacioppo, 2018; Coan & Sbarra, 2015; Ryan & Deci, 2000). For instance, the perception of social threats can challenge the ability to self-regulate, contributing to both unhealthy behaviors (e.g., physical inactivity, alcohol abuse) and downstream adverse health outcomes (Hawkley & Cacioppo, 2010). Conversely, subjective feelings of social closeness can aid in physiological self-regulation. For example, intensive measurement research shows that on occasions when individuals report feelings of social connection, they have higher body temperature compared to their usual, which is important for thermoregulation (Inagaki & Human, 2020). In a similar vein, our findings emphasize the interplay between mind and body in the context of interpersonal relationships.

Extensive research has focused on the importance of interpersonal relationships for human flourishing, suggesting that the absence of social connection and contact (i.e., loneliness and social isolation) is contributing to a major public health concern (Holt-Lunstad, 2022). Notably, previous research that encouraged participants to reflect on their daily experiences of social interactions at the end of each day for 9 weeks found that adults who increased in perceived social connectedness and positive emotions during the study protocol also increased on measures of autonomic flexibility, assessed via vagal tone (Kok & Fredrickson, 2010). Building upon this research, and in tandem with our findings, future intervention work may investigate the extent to which appreciating and reflecting on coexperienced positive emotions may further foster HPA axis activity, particularly in the context of daily stressors and challenges. Notably, the present findings highlight the importance of focusing on the daily lives of

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older adults. Specifically, these findings may permit opportunities to shed light on ways by which older adults may shape their own independence and well-being at a juncture when intervention is still possible.

Finally, in our assessments of positive emotions, we did not explicitly distinguish valence from arousal, which presents a noteworthy opportunity for future research. According to the circumplex model of emotions (Russell, 1980), "happy" tends to be high in positive valence, though it has also been categorized as high arousal. Conversely, "relaxed" is low arousal but has also been categorized as high in positive valence. While Russell (1980) did not investigate "interest," other research suggests that it tends to be relatively mid-to-high in valence and mid-to-low in arousal (Hepach et al., 2011). Our sensitivity analyses showed that coexperienced happiness and relaxation, but not interest, were associated with lower cortisol. As "happy" and "relaxed" tend to span the arousal spectrum, yet both were important for cortisol secretion, these findings suggest that positive valence (as opposed to arousal) may drive the buffering effect of coexperienced positive emotions on cortisol secretion. "Interest," in contrast, may be more cognitively engaging than stress-buffering, aligning with prior research suggesting that its valence and arousal are relatively moderate (Hepach et al., 2011). However, this is an emerging field, and these findings should be considered carefully in light of research showing age-related differences in the arousal of happiness; previous work shows that while happiness is high in positive valence irrespective of age, older adults are more likely to associate happiness with peacefulness compared to younger adults (Mogilner et al., 2011). Moreover, older adults tend to increasingly value low-arousal positive emotions over high-arousal positive emotions, in addition to achieving their ideal positive emotions compared to younger adults (Scheibe et al., 2013). Future research should investigate a wider range of coexperienced positive and negative emotions in age-heterogenous samples, as well as whether different emotions with similar arousal (e.g., fear and excitement) are distinguishable at a physiological level.

Strengths, Limitations, and Future Directions

This present research included 642 community-residing older adults spanning two countries (Canada and Germany) who were assessed at up to seven occasions per day for seven consecutive days. Participant adherence to the study protocol was high (Study 1: 91% of all measurement occasions; Studies 2 and 3: 98% of all measurement occasions). As a further strength, our findings are based on multisource data (self-reported emotions and biomarker data) embedded within an intensive measurement design. Together, the present research complements lab-based work on positivity resonance and intensive measurement research on perceived positivity resonance with a study design that facilitated examination of the daily dynamics of coexperienced positive emotions and momentary cortisol secretion as individuals went about their daily lives.

Several limitations warrant discussion. First, measurement occasions were fixed in time, and we only assessed individuals within a couple. Thus, given our focus on dyads within long-term relationships, we did not assess coexperienced positive emotions within social interactions outside of the relationship partners (i.e., we did not have network data). Future research should investigate coexperienced emotions in dyads beyond cohabiting relationship partners and whether sharing positive emotions accumulates across social connections; it is possible that individuals who have additional healthy, supportive relationships are better able to experience positive emotions with their relationship partner.

Second, older relationship partners are more likely to spend more of the day together due to age-related changes in responsibilities and contextual factors, providing an ideal set of circumstances for investigating whether positivity resonance can be captured between two individuals in daily life. However, investigating the extent to which younger relationship partners coexperience positive emotions in daily life would certainly contribute to the existing literature. Specifically, consistent with the strength and vulnerability integration theory (Charles, 2010), older adults use emotion-regulation strategies more effectively (Burr et al., 2021; Carstensen et al., 2011; Liao et al., 2023; Sims et al., 2015; Young & Mikels, 2020) and report more positive emotions on average (Carstensen et al., 2011; Charles et al., 2001; Mroczek & Spiro, 2005; Park et al., 2023). Again though, research within this field is predominantly based on individually experienced positive emotions. It is possible that younger dyads experience similarly high levels of coexperienced positive emotions on the occasions when they have the opportunity to be together.

Third, our sample included relatively racially diverse individuals from Canada, as well as individuals who grew up in both East and West Germany. However, we did not have the necessary data to address questions of cultural differences in a meaningful way. For example, East Asians, who comprised 37% of the Canadian subsample and ~10% of the total sample, are a heterogeneous group, and we lack key contextual variables important for nuanced investigation and interpretation, such as immigration status, birthplace, and generational background. Future research should investigate whether the links between coexperienced positive emotions and cortisol secretion vary based on cultural context (e.g., acculturation and enculturation processes; traditionally independent vs. interdependent backgrounds), particularly considering research showing between-dyad differences in cortisol secretion based on political and ideological context. For example, previous research shows that cortisol synchrony was higher in more politically conservative areas compared to liberal areas (Pauly, Kolodziejczak, et al., 2021), potentially due to the link between right-oriented political views and traditional family values (e.g., Caprara & Vecchione, 2018). Furthermore, all participants were relatively healthy, highly educated older adults in mostly long-term, mixed-sex, highly satisfying relationships. These sample characteristics limit the generalizability of our findings. For example, we cannot generalize to older adults who are unable to respond to survey prompts, which may also reflect an inability to meaningfully respond to one's relationship partner. Additionally, we cannot generalize to older adults who are in long-term care or those who are single, divorced, separated, or widowed. Future research should aim to recruit and investigate these associations in diverse samples.

Fourth, we operationally defined positivity resonance as moments when relationship partners were together, and both reported higher positive emotions compared to themselves. Notably, while this definition is a reasonable starting point based on the data available, we also acknowledge that a binary approach is limited in terms of capturing the full range of emotional intensity, though the models do account for individually experienced positive emotions. Laboratory studies have assessed coexperienced positive emotions by asking

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participants to move a rating dial reflecting their emotional experience ranging from negative to positive valence (Ruef & Levenson, 2007) and then computing the moments when both partners simultaneously reported any degree of positive emotions. In the current data sets, positive and negative emotions were assessed as separate constructs, consistent with previous intensive measurement research suggesting that the factor structure of positive and negative emotions are independent at the between-person level and correlated but distinct at the within-person level (Rush & Hofer, 2014). Here, response options ranged from 0 (*not at all*) to 100 (*very much*) for each emotion, with high average levels of positive emotions reported across participants and occasions ($M = 69$, $SD = 13$). We selected the within-person mean of positive emotions as a cutoff for determining when relationship partners were coexperiencing positive emotions. By focusing on an individually relevant relative indicator (i.e., positive emotions compared to oneself), our operational definition of coexperienced positive emotions may be more conservative than laboratory-based approaches. Future work should investigate the boundary conditions and alternative definitions of momentary coexperienced positive emotions, such as any degree of positive emotions in the absence of negative emotions or cutoffs based on other metrics (e.g., within-person median levels or between-person mean levels). Additionally, although we selected occasions when relationship partners reported being together, we were unable to detect whether relationship partners were actively sharing in or only coincidentally experiencing positive emotions. Likewise, we were unable to assess the extent to which relationship partners engaged in caring nonverbal synchrony (e.g., movements, sounds, and gestures that convey affiliation). To capture the extent to which relationship partners are actively sharing momentary positive emotions, future work may draw on the wealth of digital recording options (e.g., in-home sensor systems, Levenson et al., 2024; the Electronically Activated Recorder, Mehl, 2017) to assess additional aspects of positivity resonance in the moments preceding the reminder to complete momentary electronic surveys.

Fifth, building upon positivity resonance theory (Fredrickson, 2016), the broaden-and-build theory of positive emotions (Fredrickson, 2004), and the Main Effect Model of Positive Affect and Health (Pressman & Cohen, 2005; Pressman et al., 2019), we focused on the importance of coexperienced positive emotions. Yet, the extent to which coexperienced negative emotions are linked with cortisol secretion, as well as a range of other daily behaviors (e.g., psychological stressors, health behaviors), would be an interesting question for future research. Our previous work (Yoneda et al., 2024) showed that higher *relationship partners'* positive emotions were associated with own lower momentary and daily cortisol, but that partners' negative emotions were not linked with momentary cortisol nor total daily cortisol. We posited that this may reflect more developed socioemotional regulation in older adulthood, such that older partners protect their spouse from sharing, physiologically, in negative emotions. Future work should consider explicitly testing age-related differences between coexperienced emotions in younger and older dyads.

Finally, although our lagged analyses provide some support for the temporal ordering of these dynamic processes, we cannot infer causality based on observational data. Moreover, whether momentary cortisol is a mechanism contributing to long-term HPA axis alteration important for health outcomes remains unclear (Doane & Adam, 2010). The existing literature suggests that, based on multiple cortisol samples assessed across several days, higher AUC_g and mean cortisol levels are associated with adverse health outcomes in older adulthood (e.g., DeSantis et al., 2012; Herriot et al., 2017; Piazza et al., 2018). As lower momentary cortisol levels would contribute to lower AUC_g and mean cortisol levels, momentary cortisol may also be a protective factor for health outcomes. How and whether momentary patterns of cortisol fluctuation are linked with atypical cortisol rhythms (e.g., flatter increases and declines or chronically elevated cortisol levels) is a crucially important research question for future research. Furthermore, future research should investigate whether coexperienced positive emotions in daily life are linked with perceived stress, markers of relationship quality, and health outcomes at various time scales.

Conclusions

A substantial body of literature has found that positive emotions and experiences in everyday life benefit physiological health. However, less is known about the role of social context in these associations. Understanding the role of coexperienced positive emotions in everyday physiological regulation is crucial, especially since older adults spend most of their time with a few close relationships, such as a spouse (Carstensen et al., 1999). Building upon predominantly laboratory-based research (e.g., Wells et al., 2022), our findings show that older adult relationship partners frequently coexperience positive emotions in the context of everyday life and that coexperiencing positive emotions is associated with lower momentary cortisol levels, above and beyond the impact of individually experienced emotions. Moreover, the benefits of coexperiencing positive emotions with one's spouse on cortisol levels appear to extend beyond the present moment, predicting lower cortisol levels at subsequent assessments in the day. These findings underscore the importance of fostering positive shared emotions in close relationships, which may promote physiological health in older adulthood. Future research should continue to explore the mechanisms underlying these associations and the potential for interventions aimed at enhancing coexperienced positive emotions.

References

Adam, E. K., Quinn, M. E., Tavernier, R., McQuillan, M. T., Dahlke, K. A., & Gilbert, K. E. (2017). Diurnal cortisol slopes and mental and physical health outcomes: A systematic review and meta-analysis. *Psychoneuroendocrinology*, *83*, 25–41. https://doi.org/10.1016/j.psyneuen.2017.05.018

Ajrouch, K. J., Hu, R. X., Webster, N. J., & Antonucci, T. C. (2024). Friendship trajectories and health across the lifespan. *Developmental Psychology*, *60*(1), 94–107. https://doi.org/10.1037/dev0001589

Almeida, D. M., Piazza, J., Liu, Y., & Zarit, S. H. (2020). Use of saliva to better understand the daily experience of adulthood and aging. In D. A. Granger & M. K. Taylor (Eds.), *Salivary bioscience: Foundations of interdisciplinary saliva research and applications* (pp. 655–674). Springer. https://doi.org/10.1007/978-3-030-35784-9_27

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2014). *Fitting linear mixed-effects models using lme4*. arXiv. https://doi.org/10.48550/arXiv.1406.5823

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Berman, C. J., West, T. N., Zhou, J., Tan, K. R., Prinzing, M. M., & Fredrickson, B. L. (2024). Positive emotions co-experienced with strangers and acquaintances predict COVID-19 vaccination intentions through prosocial tendencies. *Social Science & Medicine*, *346*, Article 116671. https://doi.org/10.1016/j.socscimed.2024.116671

Boehm, J. K., Chen, Y., Qureshi, F., Soo, J., Umukoro, P., Hernandez, R., Lloyd-Jones, D., & Kubzansky, L. D. (2020). Positive emotions and favorable cardiovascular health: A 20-year longitudinal study. *Preventive Medicine*, *136*, Article 106103. https://doi.org/10.1016/j.ypmed.2020.106103

Boothby, E. J., Clark, M. S., & Bargh, J. A. (2014). Shared experiences are amplified. *Psychological Science*, *25*(12), 2209–2216. https://doi.org/10.1177/0956797614551162

Brown, C. L., Chen, K.-H., Wells, J. L., Otero, M. C., Connelly, D. E., Levenson, R. W., & Fredrickson, B. L. (2022). Shared emotions in shared lives: Moments of co-experienced affect, more than individually experienced affect, linked to relationship quality. *Emotion*, *22*(6), 1387–1393. https://doi.org/10.1037/emo0000939

Burr, D. A., Castrellon, J. J., Zald, D. H., & Samanez-Larkin, G. R. (2021). Emotion dynamics across adulthood in everyday life: Older adults are more emotionally stable and better at regulating desires. *Emotion*, *21*(3), 453–464. https://doi.org/10.1037/emo0000734

Butler, E. A. (2011). Temporal interpersonal emotion systems: The "TIES" that form relationships. *Personality and Social Psychology Review*, *15*(4), 367–393. https://doi.org/10.1177/1088868311411164

Cacioppo, J. T., & Cacioppo, S. (2018). Loneliness in the modern age: An evolutionary theory of loneliness (ETL). In J. M. Olson (Ed.), *Advances in experimental social psychology* (Vol. 58, pp. 127–197). Elsevier. https://doi.org/10.1016/bs.aesp.2018.03.003

Caprara, G. V., & Vecchione, M. (2018). On the left and right ideological divide: Historical accounts and contemporary perspectives. *Political Psychology*, *39*(S1), 49–83. https://doi.org/10.1111/pops.12476

Carr, D., & Utz, R. L. (2020). Families in later life: A decade in review. *Journal of Marriage and Family*, *82*(1), 346–363. https://doi.org/10.1111/jomf.12609

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist*, *54*(3), 165–181. https://doi.org/10.1037/0003-066X.54.3.165

Carstensen, L. L., Turan, B., Scheibe, S., Ram, N., Ersner-Hershfield, H., Samanez-Larkin, G. R., Brooks, K. P., & Nesselroade, J. R. (2011). Emotional experience improves with age: Evidence based on over 10 years of experience sampling. *Psychology and Aging*, *26*(1), 21–33. https://doi.org/10.1037/a0021285

Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, *136*(6), 1068–1091. https://doi.org/10.1037/a0021232

Charles, S. T., & Carstensen, L. L. (2007). Emotion regulation and aging. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 307–327). Guilford Press.

Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology*, *80*(1), 136–151. https://doi.org/10.1037/0022-3514.80.1.136

Chen, K.-H., Brown, C. L., Wells, J. L., Rothwell, E. S., Otero, M. C., Levenson, R. W., & Fredrickson, B. L. (2021). Physiological linkage during shared positive and shared negative emotion. *Journal of Personality and Social Psychology*, *121*(5), 1029–1056. https://doi.org/10.1037/pspi0000337

Chopik, W. J. (2017). Associations among relational values, support, health, and well-being across the adult lifespan. *Personal Relationships*, *24*(2), 408–422. https://doi.org/10.1111/pere.12187

Coan, J. A., & Sbarra, D. A. (2015). Social baseline theory: The social regulation of risk and effort. *Current Opinion in Psychology*, *1*, 87–91. https://doi.org/10.1016/j.copsyc.2014.12.021

Cohn, M. A., Fredrickson, B. L., Brown, S. L., Mikels, J. A., & Conway, A. M. (2009). Happiness unpacked: Positive emotions increase life satisfaction by building resilience. *Emotion*, *9*(3), 361–368. https://doi.org/10.1037/a0015952

Cowen, A. S., & Keltner, D. (2017). Self-report captures 27 distinct categories of emotion bridged by continuous gradients. *Proceedings of the National Academy of Sciences of the United States of America*, *114*(38), E7900–E7909. https://doi.org/10.1073/pnas.1702247114

Cranford, J. A., Shrout, P. E., Iida, M., Rafaeli, E., Yip, T., & Bolger, N. (2006). A procedure for evaluating sensitivity to within-person change: Can mood measures in diary studies detect change reliably? *Personality and Social Psychology Bulletin*, *32*(7), 917–929. https://doi.org/10.1177/0146167206287721

Danner, D. D., Snowdon, D. A., & Friesen, W. V. (2001). Positive emotions in early life and longevity: Findings from the nun study. *Journal of Personality and Social Psychology*, *80*(5), 804–813. https://doi.org/10.1037/0022-3514.80.5.804

Darwin, C. (1872). *The expression of emotions in man and animals*. D. Appleton. https://doi.org/10.1037/10001-000

DeSantis, A. S., DiezRoux, A. V., Hajat, A., Aiello, A. E., Golden, S. H., Jenny, N. S., Seeman, T. E., & Shea, S. (2012). Associations of salivary cortisol levels with inflammatory markers: The Multi-Ethnic Study of Atherosclerosis. *Psychoneuroendocrinology*, *37*(7), 1009–1018. https://doi.org/10.1016/j.psyneuen.2011.11.009

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, *130*(3), 355–391. https://doi.org/10.1037/0033-2909.130.3.355

Doane, L. D., & Adam, E. K. (2010). Loneliness and cortisol: Momentary, day-to-day, and trait associations. *Psychoneuroendocrinology*, *35*(3), 430–441. https://doi.org/10.1016/j.psyneuen.2009.08.005

Farrell, A. K., Stimpel, A. L., Stanton, S. C. E., & Slatcher, R. B. (2023). Relationship quality and physical health: Responsiveness as an active ingredient predicting health across the lifespan. *Current Opinion in Psychology*, *52*, Article 101628. https://doi.org/10.1016/j.copsyc.2023.101628

Fingerman, K. L., & Charles, S. T. (2010). It takes two to tango: Why older people have the best relationships. *Current Directions in Psychological Science*, *19*(3), 172–176. https://doi.org/10.1177/0963721410370297

Franke, K. B., Huebner, E. S., & Hills, K. J. (2017). Cross-sectional and prospective associations between positive emotions and general life satisfaction in adolescents. *Journal of Happiness Studies*, *18*(4), 1075–1093. https://doi.org/10.1007/s10902-016-9763-8

Fredrickson, B. L. (2000). Cultivating positive emotions to optimize health and well-being. *Prevention & Treatment*, *3*(1), Article 1. https://doi.org/10.1037/1522-3736.3.1.31a

Fredrickson, B. L. (2004). The broaden-and-build theory of positive emotions. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *359*(1449), 1367–1377. https://doi.org/10.1098/rstb.2004.1512

Fredrickson, B. L. (2016). Love: Positivity resonance as a fresh, evidence-based perspective on an age-old topic. In L. F. Barrett, M. Lewis, & J. M. Havilan-Jones (Eds.), *Handbook of emotions* (Vol. 4, pp. 847–858). Guilford Press.

Fredrickson, B. L., & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition and Emotion*, *12*(2), 191–220. https://doi.org/10.1080/026999398379718

Fredrickson, B. L., Mancuso, R. A., Branigan, C., & Tugade, M. M. (2000). The undoing effect of positive emotions. *Motivation and Emotion*, *24*(4), 237–258. https://doi.org/10.1023/A:1010796329158

Gaffey, A. E., Bergeman, C. S., Clark, L. A., & Wirth, M. M. (2016). Aging and the HPA axis: Stress and resilience in older adults. *Neuroscience and Biobehavioral Reviews*, *68*, 928–945. https://doi.org/10.1016/j.neubiorev.2016.05.036

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Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., & Schupp, J. (2019). The German Socio-Economic Panel (SOEP). *Jahrbücher für Nationalökonomie und Statistik*, *239*(2), 345–360. https://doi.org/10.1515/jbnst-2018-0022

Gross, J. J., Richards, J. M., & John, O. P. (2006). Emotion regulation in everyday life. In D. K. Snyder, J. Simpson, & J. N. Hughes (Eds.), *Emotion regulation in couples and families: Pathways to dysfunction and health* (pp. 13–35). American Psychological Association. https://doi.org/10.1037/11468-001

Haase, C. M. (2023). Emotion regulation in couples across adulthood. *Annual Review of Developmental Psychology*, *5*(1), 399–421. https://doi.org/10.1146/annurev-devpsych-120621-043836

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, *40*(2), 218–227. https://doi.org/10.1007/s12160-010-9210-8

Hendrick, S. S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and Family*, *50*(1), 93–98. https://doi.org/10.2307/352430

Hepach, R., Kliemann, D., Grüneisen, S., Heekeren, H. R., & Dziobek, I. (2011). Conceptualizing emotions along the dimensions of valence, arousal, and communicative frequency—Implications for social-cognitive tests and training tools. *Frontiers in Psychology*, *2*, Article 266. https://doi.org/10.3389/fpsyg.2011.00266

Herriot, H., Wrosch, C., Gouin, J. P., & Miller, G. E. (2017). Intra-individual cortisol variability and low-grade inflammation over 10 years in older adults. *Psychoneuroendocrinology*, *77*, 141–149. https://doi.org/10.1016/j.psyneuen.2016.12.010

Holt-Lunstad, J. (2022). Social connection as a public health issue: The evidence and a systemic framework for prioritizing the "social" in social determinants of health. *Annual Review of Public Health*, *43*(1), 193–213. https://doi.org/10.1146/annurev-publhealth-052020-110732

Hoyt, L. T., Zeiders, K. H., Ehrlich, K. B., & Adam, E. K. (2016). Positive upshots of cortisol in everyday life. *Emotion*, *16*(4), 431–435. https://doi.org/10.1037/emo0000174

Inagaki, T. K., & Human, L. J. (2020). Physical and social warmth: Warmer daily body temperature is associated with greater feelings of social connection. *Emotion*, *20*(6), 1093–1097. https://doi.org/10.1037/emo0000618

Joseph, N. T., Jiang, Y., & Zilioli, S. (2021). Momentary emotions and salivary cortisol: A systematic review and meta-analysis of ecological momentary assessment studies. *Neuroscience and Biobehavioral Reviews*, *125*, 365–379. https://doi.org/10.1016/j.neubiorev.2021.02.042

Kok, B. E., & Fredrickson, B. L. (2010). Upward spirals of the heart: Autonomic flexibility, as indexed by vagal tone, reciprocally and prospectively predicts positive emotions and social connectedness. *Biological Psychology*, *85*(3), 432–436. https://doi.org/10.1016/j.biopsycho.2010.09.005

Kolodziejczak, K., Drewelies, J., Pauly, T., Ram, N., Hoppmann, C., & Gerstorf, D. (2022). Physical intimacy in older couples' everyday lives: Its frequency and links with affect and salivary cortisol. *The Journals of Gerontology: Series B*, *77*(8), 1416–1430. https://doi.org/10.1093/geronb/gbac037

Kudielka, B. M., Gierens, A., Hellhammer, D. H., Wüst, S., & Schlotz, W. (2012). Salivary cortisol in ambulatory assessment—Some dos, some don'ts, and some open questions. *Psychosomatic Medicine*, *74*(4), 418–431. https://doi.org/10.1097/PSY.0b013e31825434c7

Lasikiewicz, N., Hendrickx, H., Talbot, D., & Dye, L. (2008). Exploration of basal diurnal salivary cortisol profiles in middle-aged adults: Associations with sleep quality and metabolic parameters. *Psychoneuroendocrinology*, *33*(2), 143–151. https://doi.org/10.1016/j.psyneuen.2007.10.013

Le Nguyen, K. D., & Fredrickson, B. L. (2017). Positive emotions and well-being. In D. S. Dunn (Ed.), *Positive psychology: Established and emerging issues* (pp. 29–45). Routledge/Taylor & Francis Group. https://doi.org/10.4324/9781315106304-3

Levenson, R. W. (2003). Blood, sweat, and fears: The autonomic architecture of emotion. *Annals of the New York Academy of Sciences*, *1000*(1), 348–366. https://doi.org/10.1196/annals.1280.016

Levenson, R. W., Carstensen, L. L., & Gottman, J. M. (1993). Long-term marriage: Age, gender, and satisfaction. *Psychology and Aging*, *8*(2), 301–313. https://doi.org/10.1037/0882-7974.8.2.301

Levenson, R. W., Chen, K.-H., Levan, D. T., Chen, E. Y., Newton, S. L., Paul, D., Yee, C. I., Brown, C. L., Merrilees, J., Moss, D., & Wang, G. (2024). Evaluating in-home assistive technology for dementia caregivers. *Clinical Gerontologist*, *47*(1), 78–89. https://doi.org/10.1080/07317115.2023.2169652

Levenson, R. W., Haase, C. M., Bloch, L., Holley, S. R., & Seider, B. H. (2014). Emotion regulation in couples. In J. J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed., pp. 267–283). Guilford Press.

Liao, S., Tang, W., & Zhang, X. (2023). Age-related differences in responses to social exclusion: Active regulation matters. *The Journals of Gerontology: Series B*, *78*(6), 998–1006. https://doi.org/10.1093/geronb/gbad014

Lüdecke, D., Ben-Shachar, M. S., Patil, I., Waggoner, P., & Makowski, D. (2021). performance: An R package for assessment, comparison and testing of statistical models. *Journal of Open Source Software*, *6*(60), Article 3139. https://doi.org/10.21105/joss.03139

Major, B. C., Le Nguyen, K. D., Lundberg, K. B., & Fredrickson, B. L. (2018). Well-being correlates of perceived positivity resonance: Evidence from trait and episode-level assessments. *Personality and Social Psychology Bulletin*, *44*(12), 1631–1647. https://doi.org/10.1177/0146167218771324

Marsland, A. L., Pressman, S., & Cohen, S. (2007). Positive affect and immune function. In R. Ader (Ed.), *Psychoneuroimmunology* (Vol. 2, pp. 761–779). Elsevier.https://doi.org/10.1016/B978-012088576-3/50042-3

Mehl, M. R. (2017). The electronically activated recorder (EAR): A method for the naturalistic observation of daily social behavior. *Current Directions in Psychological Science*, *26*(2), 184–190. https://doi.org/10.1177/0963721416680611

Meier, T., Otero, M., Su, S. X., Stephens, J. E., Yu, C. W., & Haase, C. M. (2024). Unraveling the Experience of Affection Across Marital and Friendship Interactions. *Affective Science*, *6*(1), 104–116. https://link.springer.com/article/10.1007/s42761-024-00277-7

Michalowski, V. I., Pauly, T., Gerstorf, D., Ashe, M. C., Madden, K. M., & Hoppmann, C. A. (2021). Time-varying associations between everyday affect and cortisol in older couples. *Health Psychology*, *40*(9), 597–605. https://doi.org/10.1037/hea0001103

Mikneviciute, G., Pulopulos, M. M., Allaert, J., Armellini, A., Rimmele, U., Kliegel, M., & Ballhausen, N. (2023). Adult age differences in the psychophysiological response to acute stress. *Psychoneuroendocrinology*, *153*, Article 106111. https://doi.org/10.1016/j.psyneuen.2023.106111

Miller, R., Plessow, F., Rauh, M., Gröschl, M., & Kirschbaum, C. (2013). Comparison of salivary cortisol as measured by different immunoassays and tandem mass spectrometry. *Psychoneuroendocrinology*, *38*(1), 50–57. https://doi.org/10.1016/j.psyneuen.2012.04.019

Mogan, R., Fischer, R., & Bulbulia, J. A. (2017). To be in synchrony or not? A meta-analysis of synchrony's effects on behavior, perception, cognition and affect. *Journal of Experimental Social Psychology*, *72*, 13–20. https://doi.org/10.1016/j.jesp.2017.03.009

Mogilner, C., Kamvar, S. D., & Aaker, J. (2011). The shifting meaning of happiness. *Social Psychological and Personality Science*, *2*(4), 395–402. https://doi.org/10.1177/1948550610393987

Mroczek, D. K., & Spiro, A., III. (2005). Change in life satisfaction during adulthood: Findings from the veterans affairs normative aging study. *Journal of Personality and Social Psychology*, *88*(1), 189–202. https://doi.org/10.1037/0022-3514.88.1.189

Muhtadie, L., Koslov, K., Akinola, M., & Mendes, W. B. (2015). Vagal flexibility: A physiological predictor of social sensitivity. *Journal of Personality and Social Psychology*, *109*(1), 106–120. https://doi.org/10.1037/pspp0000016

Ong, A. D. (2010). Pathways linking positive emotion and health in later life. *Current Directions in Psychological Science*, *19*(6), 358–362. https://doi.org/10.1177/0963721410388805

Ong, A. D., & Allaire, J. C. (2005). Cardiovascular intraindividual variability in later life: The influence of social connectedness and positive emotions. *Psychology and Aging*, *20*(3), 476–485. https://doi.org/10.1037/0882-7974.20.3.476

Oravecz, Z., Dirsmith, J., Heshmati, S., Vandekerckhove, J., & Brick, T. R. (2020). Psychological well-being and personality traits are associated with experiencing love in everyday life. *Personality and Individual Differences*, *153*, Article 109620. https://doi.org/10.1016/j.paid.2019.109620

Otero, M. C., Wells, J. L., Chen, K.-H., Brown, C. L., Connelly, D. E., Levenson, R. W., & Fredrickson, B. L. (2020). Behavioral indices of positivity resonance associated with long-term marital satisfaction. *Emotion*, *20*(7), 1225–1233. https://doi.org/10.1037/emo0000634

Otte, C., Hart, S., Neylan, T. C., Marmar, C. R., Yaffe, K., & Mohr, D. C. (2005). A meta-analysis of cortisol response to challenge in human aging: Importance of gender. *Psychoneuroendocrinology*, *30*(1), 80–91. https://doi.org/10.1016/j.psyneuen.2004.06.002

Papadimitriou, A., & Priftis, K. N. (2009). Regulation of the hypothalamic–pituitary-adrenal axis. *Neuroimmunomodulation*, *16*(5), 265–271. https://doi.org/10.1159/000216184

Park, Y., Gordon, A. M., & Mendes, W. B. (2023). Age differences in physiological reactivity to daily emotional experiences. *Affective Science*, *4*(3), 487–499. https://doi.org/10.1007/s42761-023-00207-z

Pauly, T., Drewelies, J., Kolodziejczak, K., Katzorreck, M., Lücke, A. J., Schilling, O. K., Kunzmann, U., Wahl, H.-W., Ditzen, B., Ram, N., Gerstorf, D., & Hoppmann, C. A. (2021). Positive and negative affect are associated with salivary cortisol in the everyday life of older adults: A quantitative synthesis of four aging studies. *Psychoneuroendocrinology*, *133*, Article 105403. https://doi.org/10.1016/j.psyneuen.2021.105403

Pauly, T., Kolodziejczak, K., Drewelies, J., Gerstorf, D., Ram, N., & Hoppmann, C. A. (2021). Political context is associated with everyday cortisol synchrony in older couples. *Psychoneuroendocrinology*, *124*, Article 105082. https://doi.org/10.1016/j.psyneuen.2020.105082

Peugh, J. L. (2010). A practical guide to multilevel modeling. *Journal of School Psychology*, *48*(1), 85–112. https://doi.org/10.1016/j.jsp.2009.09.002

Piazza, J. R., Dmitrieva, N. O., Charles, S. T., Almeida, D. M., & Orona, G. A. (2018). Diurnal cortisol profiles, inflammation, and functional limitations in aging: Findings from the MIDUS study. *Health Psychology*, *37*(9), 839–849. https://doi.org/10.1037/hea0000629

Porges, S. W. (2001). The polyvagal theory: Phylogenetic substrates of a social nervous system. *International Journal of Psychophysiology*, *42*(2), 123–146. https://doi.org/10.1016/S0167-8760(01)00162-3

Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin*, *131*(6), 925–971. https://doi.org/10.1037/0033-2909.131.6.925

Pressman, S. D., Jenkins, B. N., & Moskowitz, J. T. (2019). Positive affect and health: What do we know and where next should we go? *Annual Review of Psychology*, *70*(1), 627–650. https://doi.org/10.1146/annurev-psych-010418-102955

R Core Team. (2013). *R: A language and environment for statistical computing* [Computer software]. R Foundation for Statistical Computing. https://www.R-project.org/

Rast, P., MacDonald, S. W., & Hofer, S. M. (2012). Intensive measurement designs for research on aging. *GeroPsych*, *25*(2), 45–55. https://doi.org/10.1024/1662-9647/a000054

Raudenbush, S. W. (2002). *Hierarchical linear models: Applications and data analysis methods* (Advanced quantitative techniques in the social sciences series). Sage Publications. https://eli.johogo.com/Class/CCU/SEM/_Hierarchical%20Linear%20Models%20Applications%20and%20Data%20Analysis%20Methods_Raudenbush.pdf

Reis, H. T., Clark, M. S., & Holmes, J. G. (2004). Perceived partner responsiveness as an organizing construct in the study of intimacy and closeness. In D. J. Mashek & A. P. Aron (Eds.), *Handbook of closeness and intimacy* (pp. 211–236). Psychology Press. https://www.taylorfrancis.com/chapters/edit/10.4324/9781410610010-19/

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology & Behavior*, *79*(3), 409–416. https://doi.org/10.1016/S0031-9384(03)00160-4

Robles, T. F., Slatcher, R. B., Trombello, J. M., & McGinn, M. M. (2014). Marital quality and health: A meta-analytic review. *Psychological Bulletin*, *140*(1), 140–187. https://doi.org/10.1037/a0031859

Ruef, A. M., & Levenson, R. W. (2007). Continuous measurement of emotion: The affect rating dial. In J. A. Coan & J. J. B. Allen (Eds.), *Handbook of emotion elicitation and assessment* (pp. 286–297). Oxford University Press.

Rush, J., & Hofer, S. M. (2014). Differences in within- and between-person factor structure of positive and negative affect: Analysis of two intensive measurement studies using multilevel structural equation modeling. *Psychological Assessment*, *26*(2), 462–473. https://doi.org/10.1037/a0035666

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178. https://doi.org/10.1037/h0077714

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Scheibe, S., English, T., Tsai, J. L., & Carstensen, L. L. (2013). Striving to feel good: Ideal affect, actual affect, and their correspondence across adulthood. *Psychology and Aging*, *28*(1), 160–171. https://doi.org/10.1037/a0030561

Schlotz, W. (2019). Investigating associations between momentary stress and cortisol in daily life: What have we learned so far? *Psychoneuroendocrinology*, *105*, 105–116. https://doi.org/10.1016/j.psyneuen.2018.11.038

Seeman, T., Gruenewald, T., Karlamangla, A., Sidney, S., Liu, K., McEwen, B., & Schwartz, J. (2010). Modeling multisystem biological risk in young adults: The Coronary Artery Risk Development in Young Adults Study. *American Journal of Human Biology*, *22*(4), 463–472. https://doi.org/10.1002/ajhb.21018

Shiota, M. N., Campos, B., Oveis, C., Hertenstein, M. J., Simon-Thomas, E., & Keltner, D. (2017). Beyond happiness: Building a science of discrete positive emotions. *American Psychologist*, *72*(7), 617–643. https://doi.org/10.1037/a0040456

Sims, T., Hogan, C., & Carstensen, L. (2015). Selectivity as an emotion regulation strategy: Lessons from older adults. *Current Opinion in Psychology*, *3*, 80–84. https://doi.org/10.1016/j.copsyc.2015.02.012

Stellar, J. E., Cohen, A., Oveis, C., & Keltner, D. (2015). Affective and physiological responses to the suffering of others: Compassion and vagal activity. *Journal of Personality and Social Psychology*, *108*(4), 572–585. https://doi.org/10.1037/pspi0000010

Stephens, J. E., Hittner, E. F., & Haase, C. M. (2022). Emotion regulation in couples across the life span. In D. Dukes, A. C. Samson, & E. A. Walle (Eds.), *The Oxford handbook of emotional development* (pp. 322–338). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198855903.013.4

Steptoe, A. (2019). Happiness and health. *Annual Review of Public Health*, *40*(1), 339–359. https://doi.org/10.1146/annurev-publhealth-040218-044150

Steptoe, A., Kunz-Ebrecht, S. R., Wright, C., & Feldman, P. J. (2005). Socioeconomic position and cardiovascular and neuroendocrine responses

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following cognitive challenge in old age. *Biological Psychology*, *69*(2), 149–166. https://doi.org/10.1016/j.biopsycho.2004.07.008

Steptoe, A., & Wardle, J. (2005). Positive affect and biological function in everyday life. *Neurobiology of Aging*, *26*(Suppl. 11), 108–112. https://doi.org/10.1016/j.neurobiolaging.2005.08.016

Stine-Morrow, E. A. (2022). Research practices for a robust psychological science of adult development and aging. *Psychology and Aging*, *37*(1), 1–5. https://doi.org/10.1037/pag0000670

Thulin, E., Vilhelmson, B., & Ellder, E. (2022). Fading togetherness? Exploring generational changes in shared time use among the older population in Sweden. *Archives of Gerontology and Geriatrics*, *101*, Article 104674. https://doi.org/10.1016/j.archger.2022.104674

Tsai, J. L., Knutson, B., & Fung, H. H. (2006). Cultural variation in affect valuation. *Journal of Personality and Social Psychology*, *90*(2), 288–307. https://doi.org/10.1037/0022-3514.90.2.288

Uchino, B. N., Birmingham, W., & Berg, C. A. (2010). Are older adults less or more physiologically reactive? A meta-analysis of age-related differences in cardiovascular reactivity to laboratory tasks. *The Journals of Gerontology: Series B*, *65B*(2), 154–162. https://doi.org/10.1093/geronb/gbp127

Van Cauter, E., Leproult, R., & Kupfer, D. J. (1996). Effects of gender and age on the levels and circadian rhythmicity of plasma cortisol. *The Journal of Clinical Endocrinology & Metabolism*, *81*(7), 2468–2473. https://doi.org/10.1210/jcem.81.7.8675562

Verstaen, A., Haase, C. M., Lwi, S. J., & Levenson, R. W. (2020). Age-related changes in emotional behavior: Evidence from a 13-year longitudinal study of long-term married couples. *Emotion*, *20*(2), 149–163. https://doi.org/10.1037/emo0000551

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wells, J. L., Haase, C. M., Rothwell, E. S., Naugle, K. G., Otero, M. C., Brown, C. L., Lai, J., Chen, K.-H., Connelly, D. E., Grimm, K. J., Levenson, R. W., & Fredrickson, B. L. (2022). Positivity resonance in long-term married couples: Multimodal characteristics and consequences for health and longevity. *Journal of Personality and Social Psychology*, *123*(5), 983–1003. https://doi.org/10.1037/pspi0000385

West, T. N., & Fredrickson, B. L. (2020). Cultivating positive emotions to enhance human flourishing. In S. I. Donaldson, M. Csikszentmihalyi, & J. Nakamura (Eds.), *Positive psychological science* (pp. 38–51). Routledge. https://doi.org/10.4324/9780203731833-4

Wilcox, R. R. (2010). *Fundamentals of modern statistical methods: Substantially improving power and accuracy* (Vol. 249). Springer. https://doi.org/10.1007/978-1-4419-5525-8

Wilhelm, F. H., & Grossman, P. (2010). Emotions beyond the laboratory: Theoretical fundaments, study design, and analytic strategies for advanced ambulatory assessment. *Biological Psychology*, *84*(3), 552–569. https://doi.org/10.1016/j.biopsycho.2010.01.017

Wrosch, C., Miller, G. E., Lupien, S., & Pruessner, J. C. (2008). Diurnal cortisol secretion and 2-year changes in older adults' physical symptoms: The moderating roles of negative affect and sleep. *Health Psychology*, *27*(6), 685–693. https://doi.org/10.1037/0278-6133.27.6.685

Xu, J., & Roberts, R. E. (2010). The power of positive emotions: It's a matter of life or death—Subjective well-being and longevity over 28 years in a general population. *Health Psychology*, *29*(1), 9–19. https://doi.org/10.1037/a0016767

Yang, Y. C., Boen, C., Gerken, K., Li, T., Schorpp, K., & Harris, K. M. (2016). Social relationships and physiological determinants of longevity across the human life span. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(3), 578–583. https://doi.org/10.1073/pnas.1511085112

Yoneda, T., Lewis, N. A., Pauly, T., Haase, C. M., Gerstorf, D., & Hoppmann, C. (2025, April 4). *Co-experienced positive emotions and cortisol secretion in late life couples*. Open Science Framework. https://osf.io/wcztv

Yoneda, T., Pauly, T., Ram, N., Kolodziejczak-Krupp, K., Ashe, M. C., Madden, K., Drewelies, J., Gerstorf, D., & Hoppmann, C. A. (2024). "What's yours is mine": Partners' everyday emotional experiences and cortisol in older adult couples. *Psychoneuroendocrinology*, *167*, Article 107118. https://doi.org/10.1016/j.psyneuen.2024.107118

Young, N. A., & Mikels, J. A. (2020). Paths to positivity: The relationship of age differences in appraisals of control to emotional experience. *Cognition and Emotion*, *34*(5), 1010–1019. https://doi.org/10.1080/02699931.2019.1697647

Yuan, J. W., McCarthy, M., Holley, S. R., & Levenson, R. W. (2010). Physiological down-regulation and positive emotion in marital interaction. *Emotion*, *10*(4), 467–474. https://doi.org/10.1037/a0018699

Zhang, Y., & Han, B. (2016). Positive affect and mortality risk in older adults: A meta-analysis. *PsyCh Journal*, *5*(2), 125–138. https://doi.org/10.1002/pchj.129

Zoccola, P. M., Manigault, A., Decastro, G., Taylor, C., & Dickerson, S. S. (2025). The role of social-evaluative threat for cortisol profiles in response to psychosocial stress: A person-centered approach. *American Psychologist*, *80*(2), 165–179. https://doi.org/10.1037/amp0001335

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