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Research Article

Partner Pain and Affect in the Daily Lives of Older Couples

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Abstract

Objectives: The susceptibility of older adults' affect to fluctuations in their own health (within-person health sensitivity) indicates how they handle everyday health challenges. In old age, affective well-being is often increasingly influenced by close others, yet it is unknown whether older adults' affect is additionally susceptible to fluctuations in their spouse's health (within-partnership health sensitivity) and the extent to which age and relationship satisfaction moderate such associations.

Methods: Parallel sets of multilevel actor–partner interdependence models are applied to self-reported health (feelings of pain/discomfort) and positive and negative affect, obtained 6 times a day over 7 consecutive days from 2 independent samples, the Berlin Couple Dynamics Study (N = 87 couples; $M_{\rm age} = 75$ years; M relationship length = 46 years) and the SocioEconomic Panel Couple Dynamics Study (N = 151 couples; $M_{\rm age} = 72$ years; M relationship length = 47 years).

Results: Husbands and wives had lower positive affect and higher negative affect in moments when they reported more pain (within-person health sensitivity) and when their respective spouse reported more pain (within-partnership health sensitivity). Tests for moderation suggest that within-person, but not within-partnership, health sensitivity is lower at older ages and higher with more satisfying relationships.

Discussion: These findings empirically illustrate life-span notions that close relationships shape time-varying health—affect links and thus underscore the theoretical and practical utility of examining social—contextual antecedents of older adults' everyday affective well-being.

Keywords: Affective reactivity, Affective well-being, Health sensitivity, Older couples, Physical health

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The relevance of momentary fluctuations in health for older adults' affective well-being (health sensitivity: Schöllgen et al., 2016) is frequently acknowledged in life-span research. Conceptual accounts suggest that health-related symptoms, such as everyday aches and pains, undermine affective well-being (Charles, 2010; Lemon et al., 1972) and empirical studies report that day-to-day fluctuations in everyday pain are associated with day-to-day fluctuations in positive and negative affect (Katana et al., 2019; Waldinger & Schulz, 2010). In brief, this covariation could have beneficial consequences, as sensitivity to symptoms might imply earlier treatment, but it may also be harmful, given the physiological consequences of activated and maintained affective distress (see Potter et al., 2021 and

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Schöllgen et al., 2016, for a full discussion and direct examination of these questions). Most work on time-varying associations between everyday pain and affect focuses on the individual. This is limiting because older adults' affective experiences are increasingly influenced by the presence and quality of close relationships (English & Carstensen, 2014; Mancini & Bonanno, 2006). For example, older adults in higher quality relationships tend to have higher daily positive affect (PA) and lower daily negative affect (NA; Carr et al., 2014). To fill this gap, this project seeks to shed light onto whether older adults' moment-to-moment affect is additionally susceptible to fluctuations in *their spouse's* health (*within-partnership* health sensitivity), and whether age and relationship satisfaction moderate such associations. This is important because even healthy older adults are at risk of experiencing at least low-to-moderate levels of pain/discomfort in their everyday lives (Patel et al., 2019), which not only represents a source of immediate distress for spouses (Monin et al., 2010) but also might bear heavier connotations due to confronting them with caregiving and widowhood. It is thus important to further understand the role of everyday pain for healthy older adults' moment-to-moment affective experiences. Against this backdrop, we extend notions of *within-person* health sensitivity into the dyadic context and consider *within-partnership* health sensitivity, operationally defined as the extent to which a husband's/wife's PA and NA changes in concert with their respective wife's/husband's momentary pain/discomfort (referred to as *pain* for simplicity). We explore whether *within-partnership* health sensitivity differs with age and relationship satisfaction.

Within-Person Health Sensitivity in Daily Life (Actor Effects)

Life-span developmental frameworks propose that daily symptoms undermine emotion regulation. The general idea being that affective well-being unfolds within the context of everyday life, and that everyday life can be viewed as an *in situ* manifestation of normative age-related features, such as declining health (Baltes & Smith, 2004). Such declining health puts older adults especially at risk of experiencing pain in their everyday lives (Patel et al., 2019). Accordingly, the strengths and vulnerabilities integration model (Charles, 2010) considers everyday health-related issues an age-related vulnerability that undermines the skills older adults would otherwise use to maintain affective well-being.

Disruption of daily life is considered one pathway from which health-related vulnerabilities undermine the otherwise intact regulation of affective well-being among older adults. For example, the activity restriction model (Williamson, 1998) and activity theory (Lemon et al., 1972) suggest that symptoms that disrupt routine tasks (e.g., chores, preparing medicine) and meaningful activities (e.g., socializing) undermine older adults' moment-to-moment affect. Correspondingly, when bodily sensations, such as pain, are perceived as threatening, attention is drawn to the source of discomfort, which can interfere with daily goal pursuit (van Damme et al., 2007). Indeed, aches/pains have been shown to be disruptive to daily life and experience-sampling studies find that (daily) fluctuations therein are associated with fluctuations in older adults' affective well-being (Katana et al., 2019; Waldinger & Schulz, 2010).

Within-Partnership Health Sensitivity in Daily Life (Partner Effects)

Notions of developmental contextualism indicate that development across the life span is shaped by contextual factors such as one's significant other (Charles et al., 2021; English & Carstensen, 2014). Likewise, interpersonal theories of emotion (e.g., emotional transmission) as well as social ecology and family systems frameworks maintain that the development, maintenance, and spread of emotions are inextricably linked to an individual's relationships (Larson & Almeida, 1999; Patterson & Garwick, 1994; *crossover effects*: Westman, 2001). Indeed, spousal interrelations in PA and NA have repeatedly been observed among older couples (Bookwala & Schulz, 1996; Schimmack & Lucas, 2010).

Spouses' everyday pain experiences might also affect older adults' affect by activating both partners' stress management and coping resources (Berg & Upchurch, 2007; Holtzman & DeLongis, 2007). To illustrate, observing a partner in pain is a source of distress heightening physiological arousal (Monin et al., 2010), and coping in late-life marriages often becomes more relationship-focused, with many reporting *communal coping* whereupon health problems are viewed as a shared issue (Lewis et al., 2006). Spouses' everyday pain experiences also affect affective well-being via pain behaviors: Interdependence theory posits that married couples' affective experiences are shaped by changes in one partner's behavior (Cook & Kenny, 2005), and extant research from the health and clinical psychological literatures emphasizes that pain behaviors (e.g., distorted ambulation, [non]verbal expressions) serve to communicate discomfort (see Craig, 2009). Indeed, pain behaviors of older patients are associated with higher daily NA in their respective spouse (PA not tested: Martire et al., 2019; see also Druley et al., 2003).

Pain experiences are also part of the everyday lives of healthy older adults. However, beyond clinical populations, empirical investigations have mostly studied relatively stable individual differences. For example, studies indicate that spouses of older adults with chronic health problems have lower affective well-being than spouses of healthy adults *in general* (Ayotte et al., 2010; Bourassa et al., 2015). Such studies also suggest that associations between husbands' health and wives' well-being are stronger than vice versa, presumably

reflecting gender inequalities in education, role expectations (wives as caregivers), and cultural norms (wives assuming interdependent self-construals). However, these studies cannot detect whether associations emerge within couples' moment-to-moment experiences—the fast timescales at which mechanisms linking health and affect operate (Bolger & Laurenceau, 2013). Moreover, evaluations of everyday pain differ according to individual thresholds. Thus, repeated measures within individuals and the ensuing deviations from one's mean are an informative source of intraindividual dynamics (Katana et al., 2019). Importantly, between-person differences can result from a number of sources: if one partner reports vastly lower levels of pain than their partner, it could be that they often experience worse pain than their partner or that they experienced significantly worse pain in that specific moment, but typically the partners' pain experiences do not substantially differ. Micro-longitudinal studies able to disentangle between- from within-person sources are, however, rare. As one exception, Yorgason et al. (2006), using data from 96 couples ($M_{\rm age} = 74$ years; range: 44–88 years) who provided nightly reports about that day's physical symptoms (including aches/pain) and affect, found that husbands'/wives' daily health was linked to lower daily PA and higher daily NA in their respective spouse. However, this study was based on experiences recalled from the past 24 hr—a time frame older adults sometimes have difficulty recalling symptoms from (Redelmeier & Kahneman, 1996). This study specifically examines whether moment-to-moment pain experienced by *one's spouse* additionally undermines older adults' affective well-being.

Moderators: Age and Relationship Satisfaction

Initial evidence indicates that within-person health sensitivity declines across the many years that constitute old age (50–109 years: Schöllgen et al., 2016). The stress reactivity literature also indicates that *everyday* affective stressor reactivity declines across old age (Schilling & Diehl, 2015; Stawski et al., 2019), presumably due to increasing age-related competencies (e.g., in emotion regulation: Röcke & Brose, 2013). However, the unique qualities subsuming late-life partnerships (i.e., emotional closeness) might make spousal health-related challenges more (emotionally) overwhelming than those experienced by oneself, making it unclear whether a similar pattern of age-related differences will be detected among older adults for *within-partnership* health sensitivity. For example, spouses' everyday pain might be more overwhelming than one's own due to bearing heavier implications (e.g., caregiving/widowhood) and spouses typically bring about the highest highs and the lowest lows in older adults' affective experiences (Yorgason et al., 2006). Correspondingly, early laboratory evidence indicates that age-related reductions in emotional reactivity attenuate in contexts dealing with age-related loss and interpersonal relationships (Kunzmann & Grühn, 2005). This research hints that age-related competencies might fall short in the face of spouses' everyday pain experiences.

Conceptual perspectives posit that enduring strengths and vulnerabilities within marriages, such as relationship (dis)satisfaction, buffer or exacerbate adaptation to late-life challenges (e.g., stress-buffering hypothesis: Cassel, 1976; vulnerability-stress-adaptation model: Karney & Bradbury, 1995). To illustrate, in late-life marriages where one member faces a health-related challenge, qualities associated with relationship satisfaction (emotional support) have shown to buffer distress caused (Mancini & Bonanno, 2006). Indeed, older couples with higher relationship satisfaction have less daily within-person health sensitivity (Waldinger & Schulz, 2010). Conversely, initial evidence from the aforementioned daily-diary study by Yorgason et al. (2006) suggests that relationship satisfaction strengthens within-partnership health sensitivity (see Martire et al., 2013 and Monin et al., 2017, for similar findings in clinical populations), possibly because emotional support offered by spouses in satisfying marriages inadvertently reinforces the expression of pain (e.g., catastrophizing/amplifying: Sullivan 2012; see also Craig, 2009), or simply because marital quality denotes an increased investment in one another's well-being, thereby leading to heightened fear and thus emotional reactivity (see Pauly et al., 2020). This research implies that marital characteristics might operate differently at the individual and dyadic level, but research capturing in situ associations is needed.

The Present Study

The aim of this study was to examine within-person and within-partnership health sensitivity of older couples, and if this differs by age (across later-life) and relationship satisfaction. Drawing from and extending previous research, we expected that in moments when an individual felt more pain than usual, they would also experience higher NA and lower PA—evidence of within-person health sensitivity. We also expected that higher momentary pain of the partner would additionally and uniquely be associated with higher NA and lower PA—evidence of within-partnership health sensitivity. We expected that older age and higher relationship satisfaction would be (independently) associated with lower within-person health sensitivity, and that age and relationship satisfaction would also be associated with within-partnership health sensitivity, but we specified no direction of association. Based on evidence that PA and NA are not independent dimensions at the within-person level (Brose et al., 2015), we expected our hypotheses to hold for PA and NA alike. To test these hypotheses simultaneously, we applied multilevel modeling (MLM) to time-sampling data obtained from two independent samples of older couples.

Method

To test research questions, we used data from two experience-sampling studies of older couples: the Berlin Couple Dynamics Study (B-CDS) and the German SocioEconomic Panel Couple Dynamics Study (SOEP-CDS), wherein older couples provided reports of health (feelings of pain/discomfort) and PA and NA six times per day over seven consecutive days (for details on B-CDS, see Hülür et al., 2016, and Drewelies et al., 2020; for SOEP-CDS, see Pauly et al., 2021).

Participants and Procedure

In B-CDS, a sample of 110 couples were collected, but 23 couples were excluded because of missing data from one or both partners on any of the study variables. For the remaining 87 couples ($M_{\rm age} = 75.2$; SD = 3.9; range: 67-93) who were married or in a relationship/civil union (the terms husband/wife are used throughout as 97.3% of the couples in B-CDS – and all of those in SOEP-CDS – were married; $M_{\rm length} = 46$ years; SD = 11.7; range: 7-63) were recruited via Berlin newspapers and thereafter screened for: (a) aged 65+; (b) living together; (c) fluent in German; (d) sufficient vision to read small text; (e) sufficient hearing for the audio signal prompting assessment. Across seven consecutive days, each couple was prompted simultaneously by six chimes per day (wake up, 10 a.m., 1 p.m., 4 p.m., 7 p.m., 9 p.m.) to complete questionnaires on an iPad-based application (iDialogPad; Mutz, Cologne, Germany). Participants provided on average 41.4 of 42 possible observations (SD = 0.7; range: 36-42) and had on average 14.08 years of education. Participants gave written consent and received 100 EUR as compensation for incorporating the 7-day assessment period into an otherwise "typical" week (M = 3.6; SD = 1.1; on a 1 = very untypical, 5 = very typical scale).

In SOEP-CDS, a sample of 165 couples was collected, but 14 couples were excluded because of missing data from one or both partners on any of the study variables. For the remaining, 151 heterosexual couples ($M_{\rm age}=72.5$; SD=5.8; range: 56–89) who were married ($M_{\rm length}=47.3$ years; SD=11.5; range: 4–66) were drawn from the larger SOEP study, a representative long-term longitudinal study. Eligibility for the additional 7-day assessment used in this study required that couples: (a) live together; (b) have health data from at least three previous SOEP waves; (c) fluent in German; (d) sufficient vision to read small text; and (e) have sufficient hearing. Across seven consecutive days, both members of each couple were prompted simultaneously by six chimes per day (wake up, 10 a.m., 1 p.m., 4 p.m., 7 p.m., 9 p.m.) to complete questionnaires on an iPad-based application. Participants gave written informed consent and received 100 EUR as compensation for incorporating the 7-day assessment period into an otherwise "typical" week (M=4.1, SD=1.1, on a 1 = not at all typical, 5 = very typical scale). Ethical approval for both studies was granted by Humboldt University Berlin, Germany.

Compared to SOEP-CDS, couples in B-CDS were significantly older ($M_{\rm B-CDS}=75.21$; $M_{\rm SOEP-CDS}=72.46$; t(505)=5.37, p<.0001), more educated ($M_{\rm B-CDS}=14.10$; $M_{\rm SOEP-CDS}=9.93$; t(505)=16.78, p<.0001), had lower relationship satisfaction ($M_{\rm B-CDS}=1.46$; $M_{\rm SOEP-CDS}=4.40$; t(505)=-52.06, p<.0001), and higher PA ($M_{\rm B-CDS}=69.03$; $M_{\rm SOEP-CDS}=66.86$; t(505)=2.24, p=.03), but did not differ on levels of NA, pain, or neuroticism. Participants providing daily-diary data in the B-CDS (N=174) were younger (N=174) and included more females (N=174) than those not included (N=174), but did not significantly differ in terms of demographic or marital characteristics, affect, pain, or neuroticism. For SOEP-CDS, results revealed that participants included in our analysis (N=174) were younger (N=174) and more educated (N=174) and more educated (N=174) and more educated (N=174) than those not included (N=174), but did not significantly differ in terms of demographic or marital characteristics, affect, pain, or neuroticism.

Post hoc power calculated using Optimal Design 3.01 (Raudenbush et al., 2011) indicated statistical power of 0.952 and 0.956 to detect health sensitivity for PA and NA in the B-CDS data, and 0.970 and 0.982 to detect health sensitivity for PA and NA in the SOEP-CDS data.

Measures

Momentary positive and negative affect

Participants at each occasion reported how well positive and negative emotions described their current mood (e.g., "how sad are you at the moment?") on a slider-type scale ($0 = not \ at \ all; 100 = completely$). In B-CDS, PA was indicated by eight items (happy, relaxed, interested, satisfied, balanced, stimulated, rested, comfortable; $\omega = 0.85$) and NA by eight items (overwhelmed, sad, worried, groggy/ sluggish, frustrated, nervous, jittery, angry; $\omega = 0.83$). In SOEP-CDS, PA was indicted by a similar six items (happy, relaxed, interested, balanced, inspired, rested; $\omega = 0.76$) and NA by a similar 10 items (overwhelmed, sad, depressed, disappointed, downcast/glum, nervous, groggy/sluggish, frustrated, jittery, angry; $\omega = 0.86$). Person-specific PA and NA scores for all 42 measurement occasions were calculated as the arithmetic mean of the respective item sets (see Tables 1 and 2 for descriptives).

Momentary symptom was indicated by participants' responses to: "do you suffer from pain or physical discomfort right now?" on a slider-type scale (0= not at all; 100= completely). Responses were partitioned into trait (between-person) sand state (within-person) components (Bolger & Laurenceau, 2013) to simultaneously examine within- and between-person associations with affect. The between-person components (actor pain BP_i, partner pain BP_i) were defined as the person-specific averages of repeated measures, and the within-person components

Table 1. Descriptive Statistics and Intercorrelations Among Demographics and Central Study Variables for Husbands and Wives in Berlin Couple Dynamics Study

Variable	Intercorrelations										
	1	2	3	4	5	6	$M\left(SD\right)_{\mathrm{Wife}}$				
1. Age ^a		-0.11*	0.08*	0.01	0.23*	-0.13*	74.25 (3.55)				
2. Education	-0.15*		-0.01	0.03	-0.05	-0.22*	13.71 (2.90)				
3. Positive affect ^a	0.11*	0.08*		-0.61*	-0.28*	-0.14*	66.11 (12.54)				
4. Negative affect	-0.24*	-0.03	-0.65*		0.53*	0.10*	16.03 (11.93)				
5. Pain	-0.01	-0.07	-0.26*	0.35*		0.08*	16.63 (20.19)				
6. Relationship satisfaction	-0.30*	0.04	-0.18*	0.16*	-0.04		1.52 (0.57)				
$M(SD)_{Husband}$	76.16 (3.90)	14.45 (3.09)	70.54 (12.01)	19.61 (11.41)	21.92 (24.89)	1.40 (0.55)					

Notes: N = 174 individuals, 11% of participants (N = 19) did not report any pain. Statistics for wives are presented above the diagonal and those for the husbands are presented below the diagonal. Values for daily data are the averages of person-specific means across days. ^aHusbands and wives significantly differed on these variables. *p < .05.

Table 2. Descriptive Statistics and Intercorrelations Among Demographics and Central Study Variables for Husbands and Wives in Socio-Economic Panel Couple Dynamics Study

Variable	Intercorrelations										
	1	2	3	4	5	6	$M\left(SD\right)_{\mathrm{Wife}}$				
1. Age ^a		-0.04	-0.02	0.09*	0.04	0.14*	70.95 (5.79)				
2. Education	-0.06		0.10*	-0.20*	-0.16*	-0.01	9.78 (2.49)				
3. Positive affect ^a	0.12*	-0.02		-0.64*	-0.31*	0.30*	64.85 (13.45)				
4. Negative affect	-0.04	0.07	-0.64*		0.42*	-0.31*	16.30 (13.63)				
5. Pain	0.05	-0.05	-0.18*	0.26*		-0.07	22.65 (26.01)				
6. Relationship satisfaction	0.15*	0.03	0.32*	-0.37*	-0.15*		4.35 (0.68)				
M (SD) _{Husband}	74.00 (5.35)	10.07 (2.65)	68.96 (12.32)	14.97 (12.35)	19.94 (25.64)	4.45 (0.62)					

Notes: N=302 individuals, 18% of participants (N=27) did not report any pain. The 151 couples lived across 13 of the 16 German federal states (M=12.3 couples per federal state, SD=13.1). Statistics for wives are presented above the diagonal and those for the husbands are presented below the diagonal. Values for daily data are the averages of person-specific means across days. ^aHusbands and wives significantly differed on these variables. * p<.05.

(actor pain WPti, partner pain WPti) were defined as occasion-specific deviations from those person-specific means. We also include extent of fluctuation in actor's and partner's pain (actor pain iSDi, partner pain iSDi) as additional person-level predictors in our models because the variability of a given variable can affect the strength of its association with other variables (see Tables 1 and 2 for descriptives).

Covariates

Beyond age and relationship satisfaction, we control for education and neuroticism to ensure that our findings do not reflect well-documented gender differences in (or direct effects of) these variables. For example, those high on neuroticism tend to perceive everyday health-related events as more aversive and react with higher NA (Mroczek & Almeida, 2004). Note that in follow-up analysis neuroticism was removed from models to ensure that moderation results were not driven by its well-established associations with age and relationship satisfaction (Schaffhuser et al., 2014). Note also that dyad-level characteristics (length of marriage; number of children) were also originally included in models but were dropped for parsimony. Their inclusion did not change results.

In both data sets, *relationship satisfaction* was indicated by participants' responses to "all in all, how would you rate your current relationship?" (1 = *very poor*, 5 = *very good*). *Education* was assessed as years of formal education. *Neuroticism* was measured with the Big Five Inventory (Lang et al., 2001), wherein participants rated (1 = *strongly disagree*; 7 = *strongly agree*) how closely six statements (e.g., *worries a lot*, *is tense*) described themselves.

Statistical Analyses

To accommodate nested data (repeated occasions nested within individual and dyads), research questions were analyzed with MLM, using actor—partner interdependence models (APIMs: Bolger & Laurenceau, 2013). Acknowledging role specificity (and because dyads are inherently distinguishable by gender) we specify intercepts

for both husbands and wives: we examine whether husband/wife PA and NA is associated with fluctuations in their own pain (actor effects; within-person health sensitivity) and in their respective partner's pain (partner effects; within-partnership health sensitivity). Parallel sets of APIMs were used for each data set. Momentary PA and NA were modeled (separately) as the outcome variable in all models. Level 1 models were specified (subscript H for husbands; identical models for wives, W) as

Affect_{tiH} =
$$\beta_{0iH}$$
 + β_{1iH} (Actor Pain WP_{tiH})
+ β_{2iH} (Partner Pain WP_{tiH}) + e_{tiH} (1)

where Affect_{ii} of person i at time t is a function of a personspecific intercept coefficient, β_{0i} , person-specific coefficients indicating the extent to which affect is associated with the actor's concurrent pain, β_{1i} (actor effects), and the extent to which the actor's affect is associated with their partner's concurrent pain, β_{2i} (partner effects), as well as residual error, e_{ii} , which may be correlated within dyad. Between-person differences in the intercepts (β_{0iH} and β_{0iw}) and the personspecific coefficients (β_{1iH} , β_{2iH} , β_{1iW} , β_{2iW}) were modeled as

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\beta_{0iH} = \gamma_{00H} + \gamma_{01H} (education_{iH}) + \gamma_{02H} (age_{iH})
            +\gamma_{03H} (relationship satisfaction<sub>iH</sub>)
            + \gamma_{04H} (neuroticism<sub>iH</sub>) + \gamma_{05H} (actor pain BP<sub>iH</sub>)
            + \gamma_{06H} (actor pain iSD_{iH})
            + \gamma_{07H} (partner pain BP_{iH})
            + \gamma_{08H} (partner pain iSD_{iH})
                                                                                                                                                                                                              (2)
            + u_{0iH}
            \beta_{1iH} = \gamma_{10H} + \gamma_{11H} (age_{iH})
                       + \gamma_{12H} (relationship satisfaction<sub>iH</sub>)
                       + \gamma_{13H} (neuroticism<sub>iH</sub>) + u_{1iH}
                                                                                                                                                                                                              (3)
            \beta_{2iH} = \gamma_{20H} + \gamma_{21H} (age_{iH})
                       + \gamma_{22H} (relationship satisfaction<sub>iH</sub>)
                       + \gamma_{23H} (neuroticism<sub>iH</sub>)
                                                                                                                                                                                                              (4)
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where γ_{00} , γ_{10} , and γ_{20} indicate the prototypical level of affect, within-person association between affect and pain (actor effect), and within-partnership association between actor's affect and partner's pain (partner effect), respectively. Parameters γ_{01-08} indicate the extent to which between-person differences in affect are related to education, age, relationship satisfaction, neuroticism, and average level and variability in actor's and partner's pain. Parameters γ_{11-13} and γ_{21-23} indicate the extent to which differences in within-person and within-partnership health sensitivity, respectively, are related to age, relationship satisfaction, and neuroticism. Residual unexplained differences may be correlated across husbands and wives (at Level 2) or across occasions (at Level 1). Models were implemented in SAS PROC MIXED Version 9.4 with incomplete data treated as missing-at-random (Little & Rubin, 1987) under full information maximum likelihood estimation. All predictors were centered at person and/or sample means. To ensure results were not influenced by marital status, we excluded nonmarried couples from B-CDS (N=3 couples) in follow-up analyses. Findings were unchanged.

Results

Descriptive statistics and intercorrelations among variables at baseline are reported in Table 1 for B-CDS and Table 2 for SOEP-CDS. Compared to their wives, husbands in B-CDS were significantly older, t(203) = 3.53, p < .001, and reported significantly higher PA, t(203) = 2.39, p = .02, but did not differ in education, NA, pain, or relationship satisfaction. Similarly, compared to their wives, husbands in SOEP-CDS were significantly older, t(300) = 4.63, p < .001, and reported significantly higher PA, t(300) = 2.86, p = .009, but did not differ in education, NA, pain, or relationship satisfaction.

Within-Person Health Sensitivity (Actor Effects)

Results are reported in Table 3. First, across data sets, only wives showed between-person associations: those with higher overall pain (BP) had lower overall PA (B-CDS: $\gamma_{05W}=-0.23$, p=.003; SOEP-CDS: $\gamma_{05W}=-0.07$, p=.001) and higher overall NA (B-CDS: $\gamma_{05W}=0.27$; SOEP-CDS: $\gamma_{05W}=0.09$, ps<.001). Few associations between individual variability (iSD) in actor's pain and affect arose. Regarding within-person health sensitivity for husbands and wives: moments with more pain than usual were characterized by lower PA (B-CDS: $\gamma_{10H}=-0.11$, $\gamma_{10W}=-0.22$; SOEP-CDS: $\gamma_{10H}=-0.21$, $\gamma_{10W}=-0.12$, ps<.001), and higher NA (B-CDS: $\gamma_{10H}=0.16$, $\gamma_{10W}=0.20$; SOEP-CDS: $\gamma_{10H}=0.25$, $\gamma_{10H}=0.25$, $\gamma_{10W}=0.29$, ps<.001) than moments with less pain than usual. These actor effects are shown in the left-hand panels of Figure 1 (B-CDS) and Figure 2 (SOEP-CDS).

Moderators

Moderation by age and relationship satisfaction was detected in SOEP-CDS only: higher age was associated with attenuated within-person health sensitivity in PA ($\gamma_{11H}=0.01,\,p=.040;\,\gamma_{11W}=0.01,\,p=.019$) and in NA ($\gamma_{11W}=-0.01,\,p=.007$, but not for husbands $\gamma_{11H}=-0.01,\,p=.218$). Contrary to expectations, relationship satisfaction was associated with *exacerbated* health sensitivity in PA ($\gamma_{12H}=-0.10,\,p=.033;\,\gamma_{12W}=-0.05,\,p=.004$) and in NA ($\gamma_{12W}=0.03,\,p=.020$, but not for husbands $\gamma_{11H}=0.05,\,p=.249$). These moderation effects are shown in Supplementary Figures B1 and C1. Neuroticism was unrelated to health sensitivity.

Within-Partnership Health Sensitivity (Partner Effects)

Results are reported in Table 3. First, no evidence for between-person partner effects arose, nor was individual variability (iSD) in actor pain related to partner PA or NA. Most importantly, evidence of within-partnership health sensitivity

Table 3. Actor-Partner Interdependence Model for Husband and Wife Health Sensitivity

	Positive affect B-CDS			Negative affect B-CDS			Positive affect	SOEP-CDS		Negative affect SOEP-CDS		
		CI ₉₅			CI ₉₅			CI ₉₅			CI ₉₅	
	Est.	LL	UL	Est.	LL	UL	Est.	LL	UL	Est.	LL	UL
Intercept husband γ _{00H}	70.03**	68.23	73.06	17.22**	14.65	19.80	67.08**	65.10	69.06	16.90**	13.69	17.63
Intercept wife γ_{oow}	69.78**	65.90	70.94	18.99**	14.43	19.55	32.59**	31.42	33.57	7.75**	7.02	9.03
Education husband γ _{01H}	0.10	-0.84	1.05	0.11	-0.79	1.01	0.18	-0.46	0.83	0.17	-0.35	0.97
Education wife γ _{01W}	1.03	-0.43	2.48	-0.97	-2.09	0.14	0.12	-0.24	0.49	-0.38*	-0.71	-0.05
Age husband γ _{02H}	-0.06	-0.68	0.56	-0.64*	-1.28	-0.01	0.27	-0.07	0.60	-0.10	-0.45	0.21
Age wife γ_{02W}	0.56	-0.33	1.46	-0.38	-1.11	0.34	-0.02	-0.21	0.14	-0.08	-0.08	0.24
Rel. Sat. husband γ _{03H}	-1.50	-6.00	2.99	0.33	-4.19	4.86	2.98	-0.02	5.97	-4.04**	-6.92	-1.16
Rel. Sat. wife γ _{03W}	0.50	-5.77	4.77	-0.01	-4.16	4.14	2.44**	1.09	3.80	-2.45**	-3.69	-1.22
Neuroticism husband γ _{04H}	3.16	-0.44	6.76	-3.16	-6.89	0.56	-4.17**	-6.42	-1.92	4.98**	-2.79	7.17
Neuroticism wife γ _{04W}	1.57	-2.63	5.78	-5.25**	-8.69	-1.81	-1.83*	-2.94	-0.72	1.75**	0.73	2.77
Actor pain BP husband γ _{05H}	-0.13	-0.39	0.03	0.06	-0.08	0.20	-0.05	-0.12	0.03	0.08*	0.01	0.15
Actor pain BP wife γ _{osw}	-0.23**	-0.38	-0.08	0.27**	0.15	0.38	-0.07*	-0.11	-0.02	0.09**	0.04	0.12
Actor pain WP husband γ _{10H}	-0.11**	-0.17	-0.08	0.16**	0.11	0.21	-0.21**	-0.26	-0.16	0.25**	0.18	0.28
Actor pain WP wife γ _{10W}	-0.22**	-0.26	-0.14	0.20**	0.14	0.24	-0.12**	-0.13	-0.09	0.09**	0.07	0.11
Actor pain iSD husband γ _{06H}	-0.10	-0.45	0.25	0.45*	0.15	0.76	-0.07	-0.32	0.16	0.28*	0.06	0.51
Actor pain iSD wife γ _{06W}	-0.07	-0.47	0.34	0.22	-0.08	0.51	-0.06	-0.21	0.02	0.12*	0.03	0.21
Partner pain BP husband γ _{07H}	-0.05	-0.19	0.09	0.01	-0.12	0.15	-0.07	-0.08	0.08	0.01	-0.09	0.07
Partner pain BP wife γ _{0.7W}	0.02	-0.12	0.15	0.09	-0.16	0.31	-0.01	-0.04	0.04	0.01	-0.03	0.05
Partner pain WP husband γ ₂₀₁₄	-0.04*	-0.06	-0.01	0.04*	0.01	0.06	-0.04**	-0.05	-0.02	0.02*	0.003	0.04
Partner pain WP wife γ _{20W}	-0.01	-0.05	0.01	0.04*	0.001	0.08	-0.03**	-0.05	-0.02	0.01*	0.002	0.03
Partner pain iSD husband γ _{osH}	0.11	-0.24	0.46	-0.27	-0.56	0.03	-0.18	-0.37	0.06	0.14	-0.05	0.36
Partner pain iSD wife γ _{osw}	-0.13	-0.53	0.27	-0.03	0.004	-0.29	-0.02	-0.14	0.12	0.03	-0.07	0.13
Age * Actor pain * husband γ _{11H}	-0.001	-0.02	0.02	0.005	-0.01	0.02	0.01*	0.000	0.02	-0.01	-0.02	0.003
Age * Actor pain * wife γ _{11w}	0.004	-0.02	0.03	-0.002	-0.02	0.02	0.01*	0.000	0.02	-0.01*	-0.008	-0.001
Rel. Sat * Actor pain * husband γ _{12H}	-0.02	-0.13	0.09	0.04	-0.07	0.14	-0.10*	-0.18	-0.01	0.05	-0.04	0.14
Rel. Sat * Actor pain * wife γ _{12W}	-0.004	-0.15	0.14	-0.04	-0.14	0.07	-0.05*	-0.08	-0.02	0.03*	0.01	0.06
Neuro. * Actor pain * husband γ _{13H}	-0.08	-0.18	0.01	0.002	-0.08	0.08	-0.03	-0.10	0.04	0.05	-0.01	0.12
Neuro. * Actor pain * wife γ _{13W}	-0.03	-0.16	0.09	-0.08	-0.17	0.02	-0.001	-0.03	0.02	-0.002	-0.02	0.02
Age * Partner pain * husband γ _{21H}	0.01*	0.00002	0.02	-0.004	-0.01	0.01	-0.00	-0.000	0.000	-0.00	-0.000	0.000
Age * Partner pain * wife γ _{21W}	0.003	-0.01	0.02	0.01	-0.01	0.02	-0.00	-0.000	0.000	0.003*	0.001	0.005
Rel. Sat * Partner pain * husband γ _{22H}	0.08	0.02	0.14	-0.06	-0.12	0.01	-0.03	-0.06	0.002	0.03*	0.0003	0.06
Rel. Sat * Partner pain * wife γ _{22W}	0.004	-0.06	0.07	0.03	-0.03	0.09	-0.02	-0.001	0.04	0.02	-0.001	0.04
Neuro. * Partner pain * husband γ _{23H}	0.02	-0.03	0.07	0.003	-0.05	0.05	-0.03*	-0.05	-0.004	0.01	-0.01	0.03
Neuro. * Partner pain * wife γ _{23W}	0.02	-0.03	0.08	-0.02	-0.06	0.02	-0.01	-0.03	0.01	0.01	-0.01	0.03
Random effects	-											
Variance intercept husband (σu0H2)	114.82	73.03	156.61	96.80	60.70	132.89	125.80	92.97	158.63	109.56	86.98	131.33
Variance intercept wives (σu0W2)	152.84	94.62	211.06	84.09	61.98	129.98	32.62	23.98	57.87	25.49	19.99	40.44
variance intercept wives (000 w2)	152.07	21.02	211.00	01.07	01.70	127.70	32.02	25.70	57.07	20.77	17.77	TH.UI

Table 3. Continued

	Positive affect B-CDS			Negative affect B-CDS			Positive affect SOEP-CDS			Negative affect SOEP-CDS		
	Est.	CI ₉₅		Est.	CI_{95}			CI ₉₅			CI ₉₅	
		LL	UL		LL	UL	Est.	LL	UL	Est.	LL	UL
Variance pain WP husband (ou1H2)	0.02	-0.01	0.03	0.02	-0.01	0.03	0.04	-0.04	0.14	0.05	-0.001	0.08
Variance pain WP wives (ou1W2)	0.05	0.001	0.07	0.02	-0.01	0.03	0.01	0.000	0.000	0.01	0.000	0.001
Cov. intercept H, W (σu0H, σu0W)	67.38	25.37	109.39	25.93	-1.40	53.26	21.23	9.33	33.13	8.90	-0.84	18.65
Cov. pain WP H, int. H (ou1H, u0W)	0.48	-0.22	1.17	1.17	0.27	1.87	0.06	0.002	0.10	0.40	-0.12	0.92
Cov. pain WP W, int. H (ou1W, u0H)	0.09	0.002	0.12	0.13	0.001	0.20	0.12	0.08	0.18	0.05	-0.001	0.003
Cov. pain WP H, int. W (ou1H, u0W)	0.35	-0.48	1.18	0.46	-0.25	1.18	0.17	0.15	0.23	0.16	-0.11	0.44
Cov. pain WP W, int. W (ou1W, u0W)	0.01	0.001	0.02	0.46	-0.25	1.13	0.03	-0.06	0.001	0.05	0.001	0.08
Cov. pain WP W, H (ou1W, u1H)	0.005	-0.02	0.03	-0.003	-0.000	-0.01	-0.01	-0.001	0.001	0.003	0.000	0.004
Residual var. husband (σeH2)	164.62	154.94	174.30	143.77	134.23	152.30	128.90	91.98	157.87	102.15	98.26	106.04
Residual var. wife (oeW2)	112.13	109.78	125.87	118.44	111.37	125.51	175.42	119.01	192.36	134.04	130.83	137.25
Residual cov. husband, wife (σeHeW)	23.48	17.56	28.40	36.31	30.55	42.09	34.76	28.90	41.82	22.49	19.28	25.70

Notes: B-CDS = Berlin Couple Dynamics Study; BP = between-person; CI = confidence interval; Cov = covariance; H = husband; Int. = intercept; iSD = individual standard deviation; LL = lower level; Neuro. = neuroticism; Rel. Sat. = relationship satisfaction; SOEP-CDS = German Socio-Economic Panel Couple Dynamics Study; UL = upper level; Var. = variance; W = wife; WP = within-person (momentary deviations from person-specific mean levels of pain).

*p < .05. **p < .01.

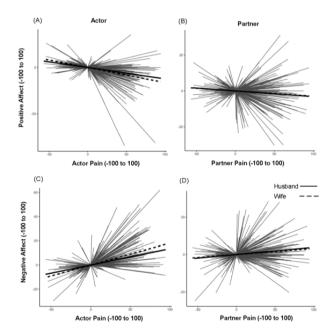


Figure 1. Within-person and within-partnership health sensitivity in Berlin Couple Dynamics Study (B-CDS). Illustrating the associations between affect and actor pain (within-person health sensitivity) and between affect and partner pain (within-partnership health sensitivity). Note that the thick black line represents the average association between pain and affect for husbands, the thick dotted black line represents the average association between pain and affect for wives, and the thin gray lines represent the association between pain and affect for each individual participant. Within-person health sensitivity can be seen in the left-hand panels: in moments when husbands (thick line) and wives (thick dotted line) report more pain than usual, they also reported lower positive affect (A) and higher negative affect (C). Within-partnership health sensitivity can be seen in the right-hand panels: in moments when husbands and wives reported more pain than usual, their respective husbands reported lower positive affect (B) and their respective wives and husbands reported higher negative affect (D). Considerable between-person differences can be seen in these within-person and within-partnership associations (gray lines). Affect and pain are person-mean-centered, so 0 represents individual.

for husbands and wives arose: in moments when the partner reported more pain than usual, the actor reported lower PA (B-CDS: $\gamma_{20H}=-0.04, p=.025$, but not for wives $\gamma_{20W}=-0.01, p=.572$; SOEP-CDS: $\gamma_{20H}=-0.04, \gamma_{20W}=-0.03, ps<.001$) and higher NA (B-CDS: $\gamma_{20H}=0.04, p=.024$, $\gamma_{20W}=0.04, p=.043$; SOEP-CDS: $\gamma_{20H}=0.02, p=.023, \gamma_{20W}=0.01, p=.026$). These partner effects are shown in the right-hand panels of Figure 1 (B-CDS) and Figure 2 (SOEP-CDS).

Moderators

Age was associated with lower within-partnership health sensitivity in PA among husbands in B-CDS: $\gamma_{21H} = 0.01$, p = .040, but not in SOEP-CDS: $\gamma_{21H} = -0.00$, p = .179, or among wives in either study. Age was also associated with higher within-partnership health sensitivity in NA among wives in SOEP-CDS: $\gamma_{21W} = 0.003$, p = .010, but not in B-CDS: $\gamma_{21W} = 0.01$, p = .459, or among husbands

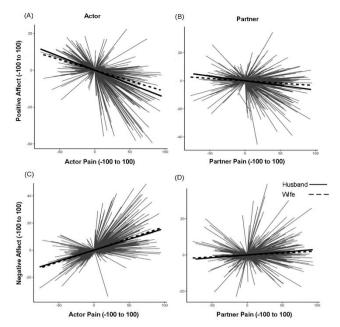


Figure 2. Within-person and within-partnership health sensitivity in German Socio-Economic Panel Couple Dynamics Study (SOEP-CDS). Illustrating the associations between affect and actor pain (within-person health sensitivity) and between affect and partner pain (within-partnership health sensitivity). Note that the thick black line represents the average association between pain and affect for husbands, the thick dotted black line represents the average association between pain and affect for wives, and the thin gray lines represent the association between pain and affect for each individual participant. Within-person health sensitivity can be seen in the left-hand panels: in moments when husbands (thick line) and wives (thick dotted line) report more pain than usual, they also reported lower positive affect (A) and higher negative affect (C). Within-partnership health sensitivity can be seen in the right-hand panels: in moments when husbands and wives reported more pain than usual, their respective husbands reported lower positive affect (B) and their respective wives and husbands reported higher negative affect (D). Considerable between-person differences can be seen in these within-person and within-partnership associations (gray lines). Affect and pain are person-mean-centered, so 0 represents individual average scores.

in either study. Higher relationship satisfaction was associated with higher within-partnership health sensitivity in NA among husbands in SOEP-CDS: $\gamma_{21H} = 0.03$, p = .047, but not in B-CDS: $\gamma_{21H} = -0.06$, p = .076, or among wives in either study.

In follow-up analyses we additionally controlled for comorbidities (self-reported diagnoses), a known correlate of health and affect (Waldinger & Schulz, 2010), and tested for the moderating role of momentary presence of partner (Lay et al., 2020). We found some evidence that those with fewer comorbidities reported more momentary PA and less momentary NA. We found no strong evidence that presence of partner was related to within-partnership health sensitivity. This is striking given that only a small number of partner effects reduced in significance (see Supplementary Table A1), indicating that within-partnership health sensitivity remained regardless of partner presence.

Experimental studies on healthy participants indicate that pain/pain sensitivity may increase throughout the day (Aviram et al., 2015). As such we additionally controlled for time-of-day in follow-up analyses. We found that while husbands/wives reliably reported less NA and more PA throughout the day, coefficients for within-person and within-partnership health sensitivity were unchanged.

Discussion

This study examined within-person and within-partnership health sensitivity among older couples, and the moderating role of age and relationship satisfaction across two samples of older couples. As expected, husbands/wives had lower PA and higher NA in moments when they reported more pain (within-person health sensitivity) and when their respective spouse reported more pain (within-partnership health sensitivity). Results also hint that within-person, but not within-partnership, health sensitivity is lower at older ages and higher with more satisfying relationships.

Within-Person Health Sensitivity (Actor Effects)

Results on within-person health sensitivity corroborate previous findings with denser sampling (six times a day for seven consecutive days) across two samples of older couples, speaking of the robustness of the phenomenon (Katana et al., 2019; Waldinger & Schulz, 2010). Extending these reports, we also found some evidence that health sensitivity decreased with age (see also Potter et al., 2021). This result mirrors well-established age-related declines in *global* health sensitivity (Schöllgen et al., 2016), which presumably reflects a combination of increased skill at regulating emotions, greater adaptive and compensatory skills, and processes of habituation (Potter et al., 2021; Röcke & Brose, 2013). Notably, age effects were detected mostly in the significantly younger sample (SOEP-CDS), hinting that such age-related competencies attenuate in advanced old age, such as in the nonagenarians in B-CDS.

Regarding moderation of within-person health sensitivity, contrary to expectations, and previous research (Waldinger & Schulz, 2010), we found some evidence to suggest that more satisfying relationships make older adults *more* sensitive to their own pain. These findings are, however, consistent with pain and social support research emphasizing that support received by close others can, via catastrophizing, amplify the experience of pain (Sullivan, 2012). Note that these effects were only detected in the significantly more satisfied sample (SOEP-CDS) and should thus be replicated in subsequent research.

Within-Partnership Health Sensitivity (Partner Effects)

Most important for our research questions, we found that older adults were not only (emotionally) susceptible to

fluctuations in their own pain, but also *in their spouses'* pain, and thus this study heeds growing calls to specify social—contextual antecedents of older adults' everyday affective experiences (Charles et al., 2021; Hoppmann & Gerstorf, 2009) and in doing so extend health and clinical psychological research by detecting these associations in healthy older adults. Within-partnership health sensitivity was consistently detected across two samples of older couples, underscoring the robustness of the phenomenon. These results empirically illustrate dyadic notions of emotion: interpersonal theories of emotion, social ecology, and family systems frameworks maintain that emotions are inextricably linked to close others, due to the intimacy, interdependence, and close proximity of such relationships (Larson & Almeida, 1999; Patterson & Garwick, 1994). Within-partnership health sensitivity may have arisen from spouses communicating their discomfort via pain behaviors (Craig, 2009), or from the pain experience of one partner activating both partner's coping resources (Berg & Upchurch, 2007). More mechanism-oriented research is needed to examine these pathways and explicitly disentangle whether they are rooted in the individual or relationship level (see Martire et al., 2019). We also found that these associations were not detected across persons, implying that fluctuations, rather than trait levels, are most harmful for older adults' everyday affect. Taken together, these results underscore the importance of acknowledging that emotion regulation is not only undermined by the individual's health-related challenges, but that it can also be jeopardized by health-related challenges of the spouse.

Contrary to prior research on clinical populations (Ayotte et al., 2010), we found no obvious pattern of differences between husbands and wives for within-partnership (or within-person) health sensitivity. It is possible that such differences exist at younger ages or in more severe health scenarios involving clinical levels of pain (see Bourassa et al., 2015), but results should be replicated before firm conclusions can be drawn. We also found no evidence for the associations between variability in actor's pain and actor/partner affect, indicating that people might be less (emotionally) susceptible to their own or their spouse's pain when such pain experiences are more predictable. However, we remain cautious not to overinterpret these findings as the inclusion of iSD was primarily for methodological reasons (i.e., to account for the size of covariation being shaped by the size of their variation). Interestingly, in follow-up analyses, within-partnership health sensitivity remained regardless of partner presence. A possible explanation is that during the course of daily communication, long-term partners become very aware of the pain status of their respective spouses, independent of whether they were together in the moments they filled out the study survey. Note also that participants were together in the majority of instances, meaning that most were only not together for a maximum of 3 hr. A lagged effect may also have occurred via, for example, the mood/behaviors of the partner in pain. However, we are cautious to overinterpret these findings as our measure ("Are you with your spouse right now?") is limited by ambiguity over what being together means (e.g., some spouses may consider themselves "together" while being in different rooms; others might take "together" to mean side by side).

Unlike at the within-person level, we found inconsistent evidence for the moderating role of age and relationship satisfaction. Considering these findings against those obtained at the within-person level, it appears that late-life marriages subsume a *gain-loss* dynamic whereby increasing age dampens affective reactions to one's healthrelated problems (*gains*: lower within-person health sensitivity), but these age benefits diminish in the face of one's spouse's health-related problems (*losses*: unchanged within-partnership health sensitivity). To this end, fluctuations in spousal pain seem to more vastly affect older adults' regulatory system (than their own pain), and are thus relevant to the growing literature aiming to specify the conditions whereupon age-related benefits in emotion regulation fall short (see Schilling & Diehl, 2014, for a review). Taken together, the findings of this study emphasize the need for practitioners to address long-term *and* momentary health-related relationship stressors in their work with later-life couples (see Martire et al., 2010).

Limitations and Outlook

Our measure of health (or lack thereof) may be problematic in light of older adults' tendency to underreport symptoms. It would thus be important to examine diverse indicators (e.g., nonverbal) to elucidate the extent to which perceptions of everyday symptoms drive health sensitivity. This would also reduce contextual confounds (e.g., social modeling: Craig, 2009). Relatedly, multi-item measurements that better capture the complexities of everyday pain (e.g., McGill Pain Questionnaire: Melzack, 1975) would provide a more detailed account of health sensitivity. Second, while pain/discomfort is a key symptom that causes suffering and is commonly used to measure daily health sensitivity (e.g., Waldinger & Schulz, 2010), these are unspecific symptoms, weakly correlated with disease severity, and thus not representative of the larger health construct. It would thus be important to examine more well-defined indicators of daily health, such as those associated with functional limitations or ones weighted by severity/life domain effected. Examining such indicators would also help shed light on the pathways (e.g., daily disruption) subsuming health sensitivity. Third, a more fine-grained measure of togetherness, combined with measures of daily spousal communication, is needed in order to better understand why presence of spouse was largely unrelated to within-partnership health sensitivity.

An important next step is to elucidate the extent to which health sensitivity has beneficial and/or harmful consequences, and how strongly such consequences depend on

whether individual- or relationship-focused outcomes are examined. For example, if a wife shows relatively large affective reactions to her husband's momentary pain, such hisgh health sensitivity may facilitate closeness within the relationship (relationship-focused outcome) while at the same time encouraging the husband to engage in health-protective behaviors that reduce the pain experience (individual outcome). To do so, future research may wish to integrate micro- with macro-longitudinal data so as to examine such outcomes (e.g., Brose et al., 2021; Pauly et al., 2021; Potter et al., 2021). Finally, although our two-sample strategy allowed us to corroborate findings across two independent samples highlighting the robustness of our findings, future studies need to examine whether findings generalize to different contextual settings (e.g., culturally more diverse samples).

Conclusions

This study examined within-person and within-partnership health sensitivity among older couples, and the moderating role of age and relationship satisfaction across two samples of older couples. Extending previous research, results showed that older adults had lower PA and higher NA in moments when they, and their partner, reported more pain. Findings also indicated that within-person, but not within-partnership, health sensitivity might be lower at older ages and higher with more satisfying relationships. These findings correspond to life-span notions that moment-to-moment emotional functioning is influenced by contextual factors, and thus underscores the utility of examining the spouse as contributor to older adults' everyday affective well-being.

Supplementary Material

Supplementary material to this article is available. For more information see https://hdl.handle.net/21.11116/0000-000A-6FA6-F

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Conflict of Interest

None declared.

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References

- Aviram, J., Shochat, T., & Pud, D. (2015). Pain perception in healthy young men is modified by time-of-day and is modality dependent. *Pain Medicine* (*Malden, Mass.*), **16**(6), 1137–1144. doi:10.1111/pme.12665
- Ayotte, B. J., Yang, F. M., & Jones, R. N. (2010). Physical health and depression: A dyadic study of chronic health conditions and depressive symptomatology in older adult couples. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **65**(4), 438–448. doi:10.1093/geronb/gbq033
- Baltes, P. B., & Smith, J. (2004). Lifespan psychology: From developmental contextualism to developmental biocultural co-constructivism. *Research in Human Development*, **1**(3), 123–144. doi:10.1207/s15427617rhd0103_1
- Berg, C. A., & Upchurch, R. (2007). A developmental–contextual model of couples coping with chronic illness across the adult life span. *Psychological Bulletin*, **133**(6), 920–954. doi:10.1037/0033-2909.133.6.920
- Bolger, N., & Laurenceau, J. P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. Guilford Press. Bookwala, J., & Schulz, R. (1996). Spousal similarity in subjective well-being: The Cardiovascular Health Study. *Psychology and Aging*, **11**(4), 582–590. doi:10.1037/0882-7974.11.4.582
- Bourassa, K. J., Memel, M., Woolverton, C., & Sbarra, D. A. (2015). A dyadic approach to health, cognition, and quality of life in aging adults. *Psychology and Aging*, **30**(2), 449–461. doi:10.1037/pag0000025
- Brose, A., Neubauer, A. B., & Schmiedek, F. (2021). Integrating state dynamics and trait change: A tutorial using the example of stress reactivity and change in well-being. *European Journal of Personality*. doi: https://doi.org/10.1177/08902070211014055
- Brose, A., Voelkle, M. C., Lövdén, M., Lindenberger, U., & Schmiedek, F. (2015). Differences in the between-person and within-person structures of affect are a matter of degree. *European Journal of Personality*, **29**(1), 55–71. doi:10.1002/per.1961
- Carr, D., Freedman, V. A., Cornman, J. C., & Schwarz, N. (2014). Happy marriage, happy life? Marital quality and subjective well-being in later life. Journal of Marriage and Family, **76**(5), 930–948. doi:10.1111/jomf.12133
- Cassel, J. (1976). The contribution of the social environment to host resistance: The Fourth Wade Hampton Frost Lecture. *American Journal of Epidemiology*, **104**(2), 107–123. doi: 10.1093/oxfordjournals.aje.a112281
- Charles, S. T. (2010). Strength and vulnerability integration: A model of emotional well-being across adulthood. *Psychological Bulletin*, **136**(6), 1068–1091. doi:10.1037/a0021232
- Charles, S. T., Röcke, C., Sagha Zadeh, R., Martin, M., Boker, S., & Scholz, U. (2021). Leveraging daily social experiences to motivate healthy aging. The Journals of Gerontology, Series B: Psychological

- Sciences and Social Sciences, 76(Supplement 2), S157-S166. doi:10.1093/geronb/gbab028
- Cook, W. L., & Kenny, D. A. (2005). The actor–partner interdependence model: A model of bidirectional effects in developmental studies. *International Journal of Behavioral Development*, **29**(2), 101–109. doi:10.1080/01650250444000405
- Craig, K. D. (2009). The social communication model of pain. Canadian Psychology, 50(1), 22-32. doi:10.1037/a0014772
- Drewelies, J., Schade, H., Hülür, G., Hoppmann, C. A., Ram, N., & Gerstorf, D. (2020). The more we are in control, the merrier? partner perceived control and negative affect in the daily lives of older couples. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **75**(2), 338–348. doi:10.1093/geronb/gby009
- Druley, J. A., Stephens, M. A., Martire, L. M., Ennis, N., & Wojno, W. C. (2003). Emotional congruence in older couples coping with wives' osteoarthritis: Exacerbating effects of pain behavior. *Psychology and Aging*, **18**(3), 406–414. doi:10.1037/0882-7974.18.3.406
- English, T., & Carstensen, L. L. (2014). Selective narrowing of social networks across adulthood is associated with improved emotional experience in daily life. *International Journal of Behavioral Development*, **38**(2), 195–202. doi:10.1177/0165025413515404
- Holtzman, S., & Delongis, A. (2007). One day at a time: The impact of daily satisfaction with spouse responses on pain, negative affect and catastrophizing among individuals with rheumatoid arthritis. *Pain*, **131**(1–2), 202–213. doi:10.1016/j.pain.2007.04.005
- Hoppmann, C., & Gerstorf, D. (2009). Spousal interrelations in old age—A mini-review. Gerontology, 55(4), 449–459. doi: 10.1159/000211948
- Hülür, G., Hoppmann, C. A., Rauers, A., Schade, H., Ram, N., & Gerstorf, D. (2016). Empathic accuracy for happiness in the daily lives of older couples: Fluid cognitive performance predicts pattern accuracy among men. *Psychology and Aging*, **31**(5), 545–552. doi:10.1037/pag0000109
- Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, method, and research. *Psychological Bulletin*, **118**(1), 3–34. doi:10.1037/0033-2909.118.1.3
- Katana, M., Röcke, C., & Allemand, M. (2019). Intra and interindividual differences in the within-person coupling between daily pain and affect of older adults. *Journal of Behavioral Medicine*, **12**(3), 1–16. doi:10.1016/j.jpain.2011.03.003
- Kunzmann, U., & Grühn, D. (2005). Age differences in emotional reactivity: The sample case of sadness. *Psychology and Aging*, **20**(1), 47–59. doi:10.1037/0882-7974.20.1.47
- Lang, F. R., Lüdtke, O., & Asendorpf, J. B. (2001). Test quality and psychometric equivalence of the German version of the Big Five Inventory (BFI) in young, middle-aged and old adults. *Diagnostica*, **47**(3), 111–121. doi:10.1026//0012-1924.47.3.111
- Larson, R. W., & Almeida, D. M. (1999). Emotional transmission in the daily lives of families: A new paradigm for studying family process. *Journal of Marriage and the Family*, **61**(1), 5–20. doi:10.2307/353879
- Lay, J. C., Pauly, T., Graf, P., Mahmood, A., & Hoppmann, C. A. (2020). Choosing solitude: Age differences in situational and affective correlates of solitude-seeking in midlife and older adulthood. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **75**(3), 483–493. doi:10.1093/geronb/gby044
- Lemon, B. W., Bengtson, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction among inmovers to a retirement community. *Journal of Gerontology*, **27**(4), 511–523. doi:10.1093/geronj/27.4.511
- Lewis, M. A., McBride, C. M., Pollak, K. I., Puleo, E., Butterfield, R. M., & Emmons, K. M. (2006). Understanding health behavior change among couples: An interdependence and communal coping approach. *Social Science & Medicine (1982)*, **62**(6), 1369–1380. doi: 10.1016/j.socscimed.2005.08.006
- Little, R. J., & Rubin, D. B. (1987). Statistical analysis with missing data. Wiley & Sons.
- Mancini, A. D., & Bonanno, G. A. (2006). Marital closeness, functional disability, and adjustment in late life. *Psychology and Aging*, **21**(3), 600–610. doi:10.1037/0882-7974.21.3.600
- Martire, L. M., Keefe, F. J., Schulz, R., Parris Stephens, M. A., & Mogle, J. A. (2013). The impact of daily arthritis pain on spouse sleep. *Pain*, **154**(9), 1725–1731. doi:10.1016/j.pain.2013.05.020
- Martire, L. M., Schulz, R., Helgeson, V. S., Small, B. J., & Saghafi, E. M. (2010). Review and meta-analysis of coupleoriented interventions for chronic illness. *Annals of Behavioral Medicine*, **40**(3), 325–342. doi:10.1007/s12160-010-9216-2
- Martire, L. M., Zhaoyang, R., Marini, C. M., Nah, S., & Darnall, B. D. (2019). Daily and bidirectional linkages between pain catastrophizing and spouse responses. *Pain*, **160**(12), 2841–2847. doi: 10.1097/j.pain.0000000000001673
- Melzack, R. (1975). The McGill Pain Questionnaire: Major properties and scoring methods. Pain, 1(3), 277-299. doi:10.1016/0304-3959(75)90044-5
- Monin, J. K., Levy, B. R., & Kane, H. S. (2017). To love is to suffer: Older adults' daily emotional contagion to perceived spousal suffering. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **72**(3), 383–387. doi:10.1093/geronb/gbv070
- Monin, J. K., Schulz, R., Martire, L. M., Jennings, J. R., Lingler, J. H., & Greenberg, M. S. (2010). Spouses' cardiovascular reactivity to their partners' suffering. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, **65**(2), 195–201. doi:10.1093/geronb/gbp133
- Mroczek, D. K., & Almeida, D. M. (2004). The effect of daily stress, personality, and age on daily negative affect. *Journal of Personality*, **72**(2), 355–378. doi:10.1111/j.0022-3506.2004.00265.x
- Patel, K. V., Guralnik, J. M., Phelan, E. A., Gell, N. M., Wallace, R. B., Sullivan, M. D., & Turk, D. C. (2019). Symptom burden among community-dwelling older adults in the United States. *Journal of the American Geriatrics Society*, **67**(2), 223–231. doi:10.1111/jgs.15673
- Patterson, J. M., & Garwick, A. W. (1994). The impact of chronic illness on families: A family systems perspective. *Annals of Behavioral Medicine*, **16**(2), 131–142. doi:10.1093/abm/16.2.131
- Pauly, T., Gerstorf, D., Ashe, M. C., Madden, K. M., & Hoppmann, C. A. (2021). You're under my skin: Long-term relationship and health correlates of cortisol synchrony in older couples. *Journal of Family Psychology*, **35**(1), 69–79. doi:10.1037/fam0000809

- 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**, 105082. doi:10.1016/j.psyneuen.2020.105082
- Pauly, T., Michalowski, V. I., Drewelies, J., Gerstorf, D., Ashe, M. C., Madden, K. M., & Hoppmann, C. A. (2020). Cortisol synchrony in older couples: Daily socioemotional correlates and interpersonal differences. *Psychosomatic Medicine*, **82**(7), 669–677. doi:10.1097/PSY.000000000000000838
- Potter, S., Gerstorf, D., Drewelies, J., Schmiedek, F., Wolff, J., & Brose, A. (2021). Health sensitivity in the daily lives of younger and older adults: Correlates and longer-term change in health. *Aging and Mental Health*. doi: 10.1080/13607863.2021.1913475
- Raudenbush, S. W., Spybrook, J., Congdon, R., Liu, X., Martinez, A., Bloom, H., & Hill, C. (2011). Optimal design software for multilevel and longitudinal research (Version 3.01) [Software]. http://www.wtgrantfoundation.org/.
- Redelmeier, D. A., & Kahneman, D. (1996). Patients' memories of painful medical treatments: Real-time and retrospective evaluations of two minimally invasive procedures. *Pain*, **66**(1), 3–8. doi:10.1016/0304-3959(96)02994-6
- Röcke, C., & Brose, A. (2013). Intraindividual variability and stability of affect and well-being: Short-term and long-term change and stabilization processes. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry*, **26**(3), 185–199. doi:10.1024/1662-9647/a000094
- Schaffhuser, K., Wagner, J., Lüdtke, O., & Allemand, M. (2014). Dyadic longitudinal interplay between personality and relationship satisfaction: A focus on neuroticism and self-esteem. *Journal of Research in Personality*, **53**, 124–133. doi:10.1016/j.jrp.2014.08.007
- Schilling, O. K., & Diehl, M. (2014). Reactivity to stressor pile-up in adulthood: Effects on daily negative and positive affect. *Psychology and Aging*, **29**(1), 72–83. doi:10.1037/a0035500
- Schilling, O. K., & Diehl, M. (2015). Psychological vulnerability to daily stressors in old age. Zeitschrift für Gerontologie und Geriatrie, 48(6), 517–523. doi:10.1007/s00391-015-0935-7
- Schimmack, U., & Lucas, R. E. (2010). Environmental influences on well-being: A dyadic latent panel analysis of spousal similarity. *Social Indicators Research*, **98**(1), 1–21. doi:10.1007/s11205-009-9615-8
- Schöllgen, I., Morack, J., Infurna, F. J., Ram, N., & Gerstorf, D. (2016). Health sensitivity: Age differences in the within-person coupling of individuals' physical health and well-being. *Developmental Psychology*, **52**(11), 1944–1953. doi:10.1037/dev0000171
- Stawski, R. S., Scott, S. B., Zawadzki, M. J., Sliwinski, M. J., Marcusson-Clavertz, D., Kim, J., Lanza, S. T., Green, P. A., Almeida, D. M., & Smyth, J. M. (2019). Age differences in everyday stressor-related negative affect: A coordinated analysis. *Psychology and Aging*, **34**(1), 91–105. doi:10.1037/paq0000309
- Sullivan, M. J. (2012). The communal coping model of pain catastrophising: Clinical and research implications. *Canadian Psychology*, **53**(1), 32–41. doi:10.1037/a0026726
- Van Damme, S., Crombez, G., & Lorenz, J. (2007). Pain draws visual attention to its location: Experimental evidence for a threatrelated bias. *The Journal of Pain*, **8**(12), 976–982. doi:10.1016/j.jpain.2007.07.005
- Waldinger, R. J., & Schulz, M. S. (2010). What's love got to do with it? Social functioning, perceived health, and daily happiness in married octogenarians. *Psychology and Aging*, **25**(2), 422–431. doi:10.1037/a0019087
- Westman, M. (2001). Stress and strain crossover. Human Relations, 54(6), 717-751. doi:10.1177/0018726701546002
- Williamson, G. M. (1998). The central role of restricted normal activities in adjustment to illness and disability: A model of depressed affect. Rehabilitation Psychology, **43**(4), 327–347. doi:10.1037/%200090-5550.43.4.327
- Yorgason, J. B., Almeida, D., Neupert, S. D., Spiro, A., III, & Hoffman, L. (2006). A dyadic examination of daily health symptoms and emotional well-being in late-life couples. *Family Relations*, **55**(5), 613–624. doi:10.1111/j.1741-3729.2006.00430.x