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Interpersonal Tensions and Pain Among Older Adults: The Mediating Role of Negative Mood

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Abstract

Objectives: To examine whether (a) negative social encounters and physical pain are linked throughout the day, (b) negative mood mediates these associations, and (c) these associations vary by closeness with social partners.

Method: Adults aged 65+ ($n = 313$) completed ecological momentary assessments and reported their negative social encounters, physical pain, and mood every 3 hr throughout the day for 5–6 days.

Results: Multilevel models revealed that negative social encounters were associated with greater pain at each 3-hr interval and that this association was mediated by negative mood during the same interval. Negative encounters with less close partners were associated with pain, but negative encounters with close partners were not.

Discussion: Regulating older adults' negative emotions may be crucial to improving their daily pain. Further, interventions focusing on negative encounters with less close partners in daily life may help mitigate older adults' experiences of pain throughout the day.

Keywords

older adults; pain; social encounters; negative mood; ecological momentary assessments

Pain affects people of all ages, but its prevalence increases with age (Patel, Guralnik, Dansie, & Turk, 2013; Thomas, Peat, Harris, Wilkie, & Croft, 2004), considering age-related

diseases like arthritis, increased loneliness, and depression. In the United States, over 50% of community-dwelling older adults report pain that is bothersome (Patel et al., 2013). Experiences of pain are tied to lower overall well-being (e.g., sleep problems, poor psychological health; Mathias, Cant, & Burke, 2018; Murphy, Sacks, Brady, Hootman, & Chapman, 2012) and poorer quality of social relationships (Stadler, Synder, Horn, Shrout, & Bolger, 2012). When social relationships generate problems, they are associated with pain symptoms and the exacerbation of pain (Bookwala, 2005; Matsudaira et al., 2012). Yet, the underlying mechanisms linking negative social encounters and pain in late life remain unclear. Negative mood, for instance, may play a key role in understanding this association. Further, closeness with the social partner may also matter in regard to this association; negative encounters with close social partners have negative implications for well-being (Birditt et al., 2018; Newsom, Mahan, Rook, & Krause, 2008).

The current study contributes to existing literature by examining the link between negative encounters, pain, and mood at 3-hr intervals throughout the day among a sample of community-dwelling, cognitively healthy adults aged 65 and older. We understand that emotions play a strong role in pain, defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (International Association for the Study of Pain, 1994; Merskey, 1979). Yet, here we examined pain in the context of physical symptoms. Prior pain research has predominantly focused on clinical samples and has relied heavily on long-term retrospective reports (e.g., Hirsh, Waxenberg, Atchison, Gremillion, & Robinson, 2006; Williams, Pasco, Jacka, Dodd, & Berk, 2012). Yet, retrospective measures are known to have inherent biases (e.g., recall bias; Hassan, 2006). Given that mood, thoughts, symptoms, and social experiences vary over time, the use of ecological momentary assessments (i.e., EMAs) offers a comprehensive way to capture transient experiences in more natural environments (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009).

We focused on older adults because the association between negative encounters and pain may be especially salient in late life. According to the strength and vulnerability integration model (Charles, 2010), older adults often are successful at disengaging or successfully avoiding negative events that create distress; as a result, they often report higher levels of well-being than younger adults. When unable to avoid negative events, however, older adults will report similar if not greater emotional and physiological distress than younger adults (Charles, 2010). Thus, it is important to examine how negative events, such as negative social encounters, are related to well-being in later life.

The current study assessed the consequences of interpersonal tensions for experiences of pain. We used EMAs to capture older adults' negative social encounters and pain every 3 hr throughout the day. Specifically, we examined whether (a) negative social encounters and pain are linked throughout the day, (b) negative mood mediates these associations, and (c) these associations vary by closeness with social partners.

Negative Social Encounters and Pain

Negative social encounters have harmful implications for health and well-being (Newsom et al., 2008; see review by Stadler et al., 2012). The exposure–reactivity model (Almeida, 2005) explains this association. According to this model, daily stressors such as arguments or negative encounters have immediate effects on individuals' well-being. For instance, daily relationship stress is linked to depression and anxiety as well as compromised immune and endocrine function (Choi & Marks, 2008; Kiecolt-Glaser et al., 2005; Rook & Charles, 2017). Effects of daily stressors extend to pain reports as well. Prior research finds that negative social encounters or interpersonal tensions are associated with elevated pain intensity (Burns, Johnson, Mahoney, Devine, & Pawl, 1996; Cano, Weisberg, & Gallagher, 2000).

Advances in neuroscience have identified a link between social and physical pain. Social pain (i.e., the pain experienced when social relationships are damaged or lost) activates the same brain regions (e.g., dorsal anterior cingulate cortex and anterior insula) that are involved in physical pain (Eisenberger, Lieberman, & Williams, 2003). In fact, experiences of social distress have been described using physical pain words such as "hurt feelings," "broken hearted," or "crushed." Even reliving a romantic rejection activates areas of the brain associated with physical pain (Kross, Berman, Mischel, Smith, & Wager, 2011). Other studies have revealed that social and physical pain overlaps at a psychological level. For instance, recalling a socially painful experience or a physically painful experience reduces self-esteem and feelings of control and increases both negative affect and aggressive thoughts (Riva, Wirth, & Williams, 2011). Further, negative social encounters not only evoke social pain but it may also exacerbate physical pain.

Indeed, a vast literature suggests that social ties characterized by more conflict and stress are associated with the exacerbation of pain (Bookwala, 2005; Matsudaira et al., 2012). In a seminal study examining 41 women with rheumatoid arthritis, negative social encounters in the same week and 1 week prior were associated with increases in disease-related pain (Zautra et al., 1997). Additionally, in a community sample of 729 married individuals over age 50, negative spousal behaviors (e.g., arguments, criticism) were associated with increased physical symptoms such as headaches, lower backaches, and stiffness in joints in reports of general pain (Bookwala, 2005). Another study found that reporting interpersonal tensions with coworkers was associated with low back pain incidence (Matsudaira et al., 2012). Together, this work suggests that negative encounters with social partners are associated with greater pain for older adults in a variety of settings. Thus, we expected negative encounters to be associated with greater pain throughout the day.

Mechanisms Linking Negative Social Encounters to Pain

We further asked whether negative mood, such as feeling nervous/worried, irritated, bored, lonely, and sad, explains the association between negative encounters and pain. It is well established that negative encounters with social partners influence negative mood and mental health problems (Pemberton & Fuller Tyszkiewicz, 2016). For instance, negative social encounters or interpersonal tensions are linked with negative mood and emotional states on a

global level (Newsom, Nishishiba, Morgan, & Rook, 2003) and on a daily basis (English & Carstensen, 2014). For this reason, interpersonal tensions and conflicts may be associated with greater negative mood.

Moreover, negative mood has been linked with experiences of pain (see Keefe, Lumley, Anderson, Lynch, & Carson, 2001). Negative mood has been associated with reports of increased pain in both clinical and community-based samples (Charles & Almeida, 2006; Williams et al., 2012). Mood disorders can also increase the risk of developing chronic pain. Carroll, Cassidy, and Côté (2003) found that individuals who were initially pain-free and who suffered depression were 2 times more likely to develop chronic musculoskeletal pain than nondepressed individuals. In a clinical sample of population-based women, anxiety symptoms were inextricably linked with higher levels of perceived pain (Williams et al., 2012).

Taken together, negative social encounters may undermine emotional health, which, in turn, may exacerbate pain. The current study examines this on a daily level, testing whether experiencing negative encounters with social partners is related to poorer mood and therefore greater pain in daily life.

Close Social Partners and Pain

Although negative social encounters in general influence the experience of pain, the closeness of the social partner may matter with regard to this association. According to the stress-buffering model (Cohen & Wills, 1985), close social relationships can buffer the effects of negative encounters on pain. For instance, close social relationships are linked to beneficial outcomes including less severe pain and better adjustment to pain (Jensen et al., 2002). Yet, it is unclear what happens when negative encounters occur with close social partners. Although older adults actively manage their social relationships such that they foster positive encounters and avoid negative encounters (Charles, 2010), older adults do occasionally experience negative encounters and such encounters tend to occur in close family relationships and friendships (e.g., Sorkin & Rook, 2004). Furthermore, negative encounters with close social partners have implications for older adults' mental and physical health, possibly because negative encounters with close social partners violate the expectation that close social partners are supportive (Newsom et al., 2008; Uchino et al., 2012).

Negative social encounters may be more likely to occur in close ties if such ties are ambivalent (i.e., elicit both positive and negative feelings). Scholars examining ambivalent ties have linked such ties to poor psychological health (e.g., depressive symptoms), dysregulated immune systems, and heightened physiological responses such as elevated blood pressure and cardiovascular reactivity (Holt-Lunstad, Uchino, Smith, Olsen-Cerny, & Nealey-Moore, 2003; Rook, Luong, Sorkin, Newsom, & Krause, 2012; Uchino et al., 2012). In sum, negative encounters with close social partners are often predictive of negative health outcomes. Thus, we expected older adults may experience worse pain when having negative encounters with close social partners throughout the day.

Other Factors Associated With Negative Social Encounters and Pain

We considered participant characteristics that may be associated with pain and social encounters including age, gender, education, marital status, and minority status. Women report more pain than men in both experimental and clinical studies (Hirsh et al., 2006; Keefe et al., 2001). Low education has been shown to be associated with greater pain (Schmidt et al., 2007). Individuals who are partnered or married are less likely to experience pain or pain-related disability (Taylor, Davis, & Zautra, 2013). Additionally, compared with non-Hispanic White older adults, African American and Hispanic older adults report higher rates of pain (Green et al., 2003).

We also considered older adults' overall pain rating, the number of health conditions, and neuroticism. Older adults often have chronic conditions associated with pain (Barile et al., 2013), and we wanted to account for these conditions to ensure that chronic pain conditions were not confounding the results. In addition, because pain is prevalent for individuals with a greater number of health conditions (Patel et al., 2013), we accounted for the total number of health conditions (Ivey, Allen, Liu, Parmelee, & Zarit, 2017). Finally, among persons with chronic pain, individuals with higher levels of neuroticism report more intense pain due to lowered pain thresholds and more pain catastrophizing (Kadimpati, Zale, Hooten, Ditre, & Warner, 2015).

The Current Study

The current study sought to better understand the association between negative social encounters and pain throughout the day in a sample of community-dwelling older adults over age 65. We examined the link between having negative encounters with any social partner and older adults' experiences of pain every 3 hr across several days. We hypothesized that older adults having negative encounters with any social partner incur greater pain during periods of the day. We also examined negative mood as a possible mechanism underlying the potential link between negative social encounters and pain. We hypothesized that older adults having negative encounters with any social partner report poorer mood and, in turn, incur greater pain throughout the day. Finally, we considered whether the association between negative encounters and pain varies based on the closeness of social partners. We hypothesized that having negative encounters with close social partners may be detrimental for older adults' pain.

Method

Sample and Procedures

The *Daily Experiences and Well-being Study* (DEWS) included adults aged 65 and older who were recruited from urban, sub-urban, and rural areas of the Greater Austin, TX, Metropolitan Area. To participate, older adults had to be community-dwelling, independent, and not working for pay more than 20 hr a week. The initial sample included 333 older adults (aged 65–92, M_{age} = 73.96). The DEWS included a baseline face-to-face interview that lasted approximately 90–120 min followed by 5–6 days of reports every 3 hr during waking hours. During the baseline interview, participants identified their social partners and

completed a variety of assessments including overall pain ratings, health conditions, and background characteristics. The intensive data collection encompassed 3–4 weekdays and 2 weekend days. Over the 5- to 6-day period, participants reported their encounters with social partners, rated their pain and their negative mood approximately every 3 hr throughout the day via EMA surveys completed on handheld Android devices provided by the study. They received US$50 for the initial baseline interview and US$100 for completing the 5- to 6-day data collection.

Among the 333 adults who completed the initial baseline interview, 313 older adults (M_{age} = 73.96; 174 female, 139 male) participated in the 5- to 6-day intensive data collection (M_{day} = 5.29, SD 1.09; total $n = 1,657$ days). Independent t tests and χ^2 tests revealed that compared to those not included ($n = 20$), the 313 participants who completed the EMA were more likely to be non-Hispanic White ($\chi^2 = 7.19$, $p = .007$) but did not differ significantly from the nonparticipating older adults on other background characteristics or pain. The average education of the sample was slightly higher than the general older adult population in the Greater Austin area, although participants represented the full range of socioeconomic status. See Table 1 for descriptive statistics regarding the sample.

EMA Measures

Every 3 hr during waking hours, participants indicated whether they had encountered each of their 10 close social network members they had identified in the initial baseline interview. Responses were coded as 1 (*yes*) or 0 (*no*). Additionally, participants indicated whether they had interacted with someone outside of their social network such as an acquaintance, service provider, or neighbor in the prior 3 hr. Responses were coded as 1 (*yes*) or 0 (*no*). These individuals outside of the social network were classified as less close social partners.

Negative Social Encounters

For each social encounter, participants rated whether they discussed anything stressful or unpleasant coded as 1 (*yes*) or 0 (*no*; Ram et al., 2014). Using this item, we generated two variables to indicate whether participants had any negative encounters with a (a) close social partner and (b) less close social partner. Responses were coded as 1 (*yes*) or 0 (*no*).

Pain

At each assessment, participants were asked, "how much pain or discomfort did you experience in the past 3 hr." Pain was rated using a four-category scale 0 (*no pain*), 1 (*mild pain*), 2 (*moderate pain*), and 3 (*severe pain*; Stewart, 1992).

Negative Mood

Every 3 hr, participants rated the extent to which they experienced five negative emotions: nervous/worried, irritated, bored, lonely, and sad (Fingerman, Kim, Tennant, Birditt, & Zarit, 2015). Each emotion was rated on a five-category scale from 1 (*not at all*) to 5 (*a great deal*), and scores were averaged to generate a measure of negative mood ($\alpha = .72$) for each participant at each 3-hr assessment.

Covariates

In the initial baseline interview, participants reported their age; gender as 1 (*male*) or 0 (*female*); education level as 1 (*no formal education)*,2 (*elementary school*), 3 (*some high school*), 4 (*high school*), 5 (*some college/vocation or trade school*), 6 (*college graduate*), 7 (*post college education [but no additional degree]*), to 8 (*advanced degree*); and marital status recoded as 1 (*married/cohabiting*) and 0 (*not married*). We also included a variable for minority status coded as 1 (*ethnic or racial minority*) and (0 = *non-Hispanic White*), which was generated from participants' reports of ethnic and racial identities.

Participants reported how much bodily pain they experienced during the past 4 weeks coded as 0 (*no pain*) to (10 = *severe pain*; Ware & Sherbourne, 1992). We treated this as a rating of overall pain. Participants also reported whether a doctor had ever told them that they had any of the following health problems: (a) high blood pressure or hypertension, (b) diabetes or high blood sugar, (c) cancer or a malignant tumor (excluding minor skin cancer), (d) chronic lung disease such as chronic bronchitis or emphysema, (e) heart problems (e.g., heart attack, coronary heart disease, angina, congestive heart failure), (f) stroke, (g) arthritis or rheumatism, and (h) osteoporosis or osteopenia coded as 1 (*had this particular health problem*) or 0 (*did not have this particular health problem*; Wallace & Herzog, 1995). We calculated the total number of health conditions each participant had by summing these conditions for each participant (Ivey et al., 2017). Finally, participants rated their personality trait of neuroticism using 4 items from a prior study (i.e., moody, a person who worries, nervous, calm [reverse coded]; Lachman & Weaver, 1997) on a five-category scale from 1 (*not at all*) to 5 (*a great deal*). We averaged 4 items to assess neuroticism (α = .70).

Analytic Strategy

We used multilevel modeling (MLM) to examine the associations between older adults' negative social encounters and pain every 3 hr throughout the day. MLM accounts for nested and unbalanced data and provides an appropriate strategy to handle multiple observations for each participant (e.g., multiple days, multiple within-day assessments) as well as possible missing data.

We estimated an intraclass correlation (ICC) to determine whether pain varied every 3 hr throughout the day (ICC = .60). Because pain typically varies across days (Allen, Coffman, Golightly, Stechuchak, & Keefe, 2009), we included day as a nesting variable. Thus, we used three-level models with 3-hr assessments (*level 1*), nested within days (*level 2*), nested within participants (*level 3*). All models adjusted for participant (*level 3*) age, gender, education, marital status, minority status, overall pain, the number of health conditions, and neuroticism.

We first examined whether older adults experienced greater pain when they had negative encounters with any social partner using Proc Mixed in SAS (Version 9.4). Negative encounters with any social partner were the predictor, and pain was the outcome. We then examined whether negative encounters with any social partner were associated with older adults' experiences of pain via negative mood at each 3-hr interval using Mplus (Version 7). Using Mplus allows us to test direct and indirect links simultaneously. Because the literature

on three-level mediation is theoretically and mathematically debatable (see Preacher, Zhang, & Zyphur, 2011), we used a two-level mediation model. To assure the two-level model was appropriate, we estimated an ICC to determine whether negative social encounters varied between days (ICC = .24) and found that the between-day variability of negative encounters was low. Thus, we used two-level models with 3-hr assessments (*level 1*), nested within participants (*level 2*). Negative encounters with any social partner were the predictor, pain was the outcome, and negative mood was the mediator.

Finally, we examined whether the association between negative social encounters and pain varied by closeness with social partners. The majority of participants (99%) reported having both close and less close social partners. Because participants may have negative encounters with both types of social partners within the same 3-hr interval, we included both negative encounters with close social partners and negative encounters with less close social partners in the model. We used MLM, as described before, whereby negative encounters with any close social partner and negative encounters with any less close social partner were the predictors and pain was the outcome.

We also conducted lagged analyses to explore whether negative encounters with any social partner, close social partners, and less close social partners had lingering effects on pain. These models included both current and prior (i.e., lagged) assessment reports of negative social encounters as predictors.

Results

As displayed in Supplementary Table 1, participants experienced, on average, pain on 35% of the assessments (i.e., approximately 7 of the 20 assessments). Additionally, participants experienced a negative encounter on 19% of the assessments (i.e., approximately 4 of the 20 assessments). Of the negative encounters, 59% occurred with close social partners and 41% occurred with less close social partners.

Negative Social Encounters, Pain, and Negative Mood

As predicted, negative encounters with any social partner was related to greater pain at each 3-hr interval ($B = .04$, $p = .005$; Table 2). We then tested whether negative mood mediated the association between having negative encounters with any social partner and older adults' pain using Mplus. The χ^2 value for the model was significant ($\chi^2 = 64.31$, $p < .001$), with the following model fit statistics: comparative fit index (CFI) = .87, root mean square error of approximation (RMSEA) = .04 [.03, .04]. After accounting for all covariates and other associations in the model, the path between negative encounters with any social partner and pain was significant and in the positive direction ($\beta = .26$, $p < .01$; Supplementary Figure 1). The path between negative mood and pain was significant and in the positive direction ($\beta = .30$, $p < .01$; Supplementary Figure 1). Further, negative mood had a significant indirect effect on the association between having negative encounters with any social partner and older adults' experiences of pain ($\beta = .08$, $p = .001$; 95% CI [.05, .11]; Supplementary Table 2).

Close Social Partners and Pain

We also hypothesized that closeness of the social partner may affect associations between negative encounters and pain. Contrary to predictions, older adults having negative encounters with close social partners did not experience greater pain at each 3-hr interval (B = .03, p = .07; Table 3). Yet, having negative encounters with less close social partners was significantly associated with greater pain (B = .05, p = .03; Table 3).

Because the association between less close social partners and pain was significant, we tested whether negative mood mediated this association. The χ^2 value for the model was significant (χ^2 = 65.11, p < .001), with the following model fit statistics: CFI = .88; RMSEA = .03 [.03, .04]. The path between negative encounters with less close social partners and pain was significant and in the positive direction (β = .12, p < .01; Supplementary Figure 2). Additionally, the path between negative mood and pain was significant and in the positive direction (β = .31, p < .01; Supplementary Figure 2). Negative mood had a significant indirect effect on negative encounters with less close social partners and pain (β = .04, p = .001; 95% CI [.02, .06]; Supplementary Table 2).

Post Hoc Tests

We explored whether having a negative encounter with any social partner would have a lingering effect on pain. When we tested for these lagged effects, prior negative encounters were not significantly related to current pain (B = .01, p = .59; Supplementary Table 3), even though the concurrent association between negative encounters with any social partner and pain remained significant (B = .04, p = .007; Supplementary Table 3). Further exploratory analyses revealed that lagged effects on next assessment's pain were not significant for close or for less close social partners (B = .02$_{close}$, p = .39, B = .01$_{less\ close}$, p = .80; Supplementary Table 4).

The relationship with a spouse is often regarded as the most central and important relationship. Therefore, we explored whether the pattern of results could be accounted for by the spouse among participants who were married (n = 184). We entered two variables—one for negative encounters with a spouse and one for negative encounters with any partner other than the spouse. Having a negative encounter with a spouse did not influence older adults' experiences of pain at each 3-hr interval (B = .03, p = .31; findings not shown in tables). Yet, having a negative encounter with someone other than the spouse was significantly associated with greater pain (B = .06, p = .02; findings not shown in tables). These findings are consistent with the general finding that negative encounters with less close social partners are associated with pain.

We also tested an alternative model in Mplus to examine the reverse association: that negative encounters mediated the link between negative mood and pain. Findings revealed that the indirect effect of negative encounters on the association between having negative mood and older adults' experiences of pain was not significant (β = .00, p = .96; 95% CI [− .02, .02]; findings not shown in tables).

Additionally, we examined whether negative mood moderates the association between negative encounters and pain. That is, individuals in poorer mood may be more likely to

experience pain when they have a negative encounter with any social partner. Multilevel models including the interaction term of Negative Encounter × Negative Mood revealed no moderation effects for any social partner ($B = -.06$, $p = .10$) or less close social partners ($B = .04$, $p = .37$; findings not shown in tables). However, negative mood was found to moderate the association between negative encounters with close social partners and pain ($B = -.12$, $p = .001$; findings not shown in tables).

We explored other factors that may moderate the association between negative encounters and pain by estimating interaction effects for negative encounters by gender, health conditions, and ratings of overall pain over the past month. We considered negative encounters with any social partner, close social partners, and less close social partners. Multilevel models revealed no moderation effects of gender for negative encounters with any social partner ($B = .00$, $p = .58$), close social partners ($B = -.00$, $p = .69$), or less close partners ($B = .00$, $p = .56$; findings not shown in tables). Multilevel models also revealed no moderation effects of total health conditions and negative encounters with any social partner ($B = .02$, $p = .09$), close social partners ($B = .01$, $p = .25$), or less close social partners ($B = -.00$, $p = .97$; findings not shown in tables). Finally, multilevel models revealed no moderation effects of overall pain for any social partner ($B = .03$, $p = .16$), close social partners ($B = .01$, $p = .29$), or less close social partners ($B = -.00$, $p = .67$; findings not shown in tables).

Discussion

The current study examined the role of daily social encounters in older adults' experiences of physical pain. Pain increased when older adults had a stressful experience with their social partners. This association was stronger for less close social partners than for close social partners and was explained by increased negative emotion. It is not surprising that negative emotions play a role in the experience of pain, as numerous studies have documented this association (Charles & Almeida, 2006; see Keefe et al., 2001; Williams et al., 2012). Yet, prior research has focused on the role of conflict or lack of support from spouses in exacerbating pain (e.g., Bookwala, 2005). Findings here suggest greater complexity regarding the social world and pain. Negative encounters with acquaintances, service providers, club members, distant kin, or even strangers may increase the experience of pain in the moment.

Negative Social Encounters, Pain, and Negative Mood

Building on research suggesting that interpersonal stress may have harmful effects on individuals' health and well-being (Newsom et al., 2008), we found that negative social encounters exacerbated older adults' experiences of pain. This finding is consistent with the exposure–reactivity model (Almeida, 2005) suggesting that relationship stress undermines individuals' health. This finding also parallels neuroscience research showing that experiences of social pain activate the same brain regions that are involved in physical pain (Eisenberger et al., 2003).

Yet, effects of negative social encounters on pain appear to dissipate quickly; we found no lingering effect of negative encounters on subsequent reports of pain. Further, prior research

suggests that older adults may be less affected by negative encounters because they have the skills to cope with conflicts (Birditt, Fingerman, & Almeida, 2005, Blanchard-Fields, 2007; Charles, Piazza, Luong, & Almeida, 2009), so their suffering may not last long. Thus, researchers may ask about the manner in which older adults resolve negative encounters. Older adults who experience physical pain due to difficulties managing interpersonal tensions may benefit from interventions that address negative encounters as they naturally unfold.

Findings also suggest that emotions play a key role in predicting the management and perception of pain. Older adults experienced increased negative mood at the time they reported having had a negative encounter with a less close social partner and, in turn, reported more pain. Thus, an emotion regulation perspective may be useful in understanding the influence of social relationships and older adults' pain. Emotion regulation helps determine vicissitudes in emotional experience and expression (Gross, 2002). Future research might further examine emotion regulation strategies to test whether strategies that mitigate negative emotions also diminish the experience of pain. Interventions aimed at effectively regulating negative emotions may allow older adults to better adapt to negative social encounters.

Close Social Partners and Pain

Contrary to our predictions, social partner closeness influenced associations between older adults' negative encounters and pain such that negative encounters with less close social partners were associated with more pain, but negative encounters with close social partners were not associated with pain. Prior work has shown that when rating unpleasant social partners, individuals classify less close social partners as purely negative and close social partners as solely positive or mixed positive or negative (Fingerman, Hay, & Birditt, 2004). For this reason, negative encounters with less close social partners may have been even more unpleasant than those with close social partners, a possibility that we could not test using the current data.

Furthermore, older adults use adaptive emotion regulation strategies (e.g., reappraisal and acceptance) when they experience negative encounters with close social partners (Blanchard-Fields, 2007; Charles et al., 2009). Thus, they may be more successful when regulating their emotions in response to a negative social encounter with a close social partner than with someone they do not know as well. Examining the manner in which mood influences how older adults process negative encounters may be important in understanding older adults' experiences of pain. Increased negative mood may enhance negative evaluations or appraisals of interpersonal stress and affect the interpretation of their pain. Future research should study the cognitive process of negative encounters as a function of mood.

Limitations and Future Directions

There are limitations in the current study that should be considered. Assessments of events every 3 hr provided insight with potentially less retrospective memory bias than one asking people to remember over longer periods of time, but it still was not possible to determine the

causality of observed associations. That is, negative encounters could have preceded, followed, or co-occurred with pain experiences during the 3-hr period. In addition, we adjusted for potential confounding variables in the models, but other variables may exist that directly influence negative encounters, pain, or negative mood, and they may be responsible for these associations, yet were not evaluated in the study.

Additionally, the sample in this study was relatively healthy and did not experience much pain. Prior studies of pain often have relied on samples with specific painful disorders (e.g., rheumatoid arthritis; Zautra et al., 1997; osteoarthritis; Allen et al., 2009). This study examined daily pain in a community sample of older adults, thus capturing a broader spectrum of daily experiences.

The current study focused on acute, in-the-moment pain, which may be the most common experience of daily pain, but we did not ascertain whether these fluctuations were related to more chronic conditions. Further, we assessed pain broadly and did not specify whether the question referred to physical sensory pain or emotional pain. This approach reflected concerns about response burden and the font sizes necessary for older adults to complete assessments on small screens. The question was asked immediately after questions that asked about energy level and feeling tired, so participants may have thought this question referred to physical pain. Yet, we have no way to ascertain their interpretation. Differentiating between physical and emotional pain is further complicated by the large overlap between the two constructs (Eisenberger et al., 2003). Future research should examine whether physical pain and emotional pain are associated with daily social experiences in the same way.

Physical pain is often classified based on its location, duration, frequency, underlying cause, and intensity (Cole, 2002). For instance, pain may occur in different areas of the body (e.g., head, back) or different systems (e.g., nervous, musculoskeletal). As such, it may be useful to ask whether negative encounters with social partners and negative mood are associated with pain, in general, or specific types of pain. Such research may facilitate design of intervention approaches to benefit individuals in pain.

It would also be beneficial to examine negative encounters in greater detail. For instance, knowing the cause of the negative encounter or intensity of the encounter may play a role in older adults' experiences of pain. Older adults' discussions with close social partners may involve problem-solving through a difficult situation (e.g., cancer diagnosis, divorce), whereas discussions with less close social partners may be less sensitive. Further study is needed to make this distinction when examining negative encounters.

In sum, the current study sheds light on the role that interpersonal stress may have on the physical pain older adults experience on a daily basis. Pain is a public health problem—with approximately 50% of the community-dwelling older adult population experiencing pain that is considered bothersome (Patel et al., 2013). As such, it is important to illuminate how everyday social experiences are related to pain to develop strategies for improving pain. Moreover, by gaining a better understanding of the links between older adults' negative social encounters, pain, and negative mood, strategies can be targeted to help alleviate older

adults' daily pain. Assisting older adults to effectively regulate negative emotion in the face of interpersonal stress may create resiliency against pain and enhance life quality. Additionally, helping older adults reframe events or conflict may, in turn, diminish their experiences of pain. Overall, this study emphasizes the importance of daily experiences for pain and emphasizes the importance of examining the nuances of social experiences in terms of their source.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding

Author Biographies

Jamie L. Fuentecilla is a PhD graduate in human development and family sciences at the University of Texas at Austin. Her research focuses on pain in late life. She examines social and behavioral factors that may reduce older adults' pain in a daily context.

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Susan T. Charles is a professor of psychological science and nursing science at the University of California, Irvine. Her research examines emotional processes across the adult life span. She is interested in how differences in affective experience may be related to differences in cognitive and health-related processes.

Karen L. Fingerman is a professor of human development and family sciences and the director of the Texas Aging & Longevity Center at the University of Texas at Austin. Her research addresses social and emotional aspects of adult development. She is the principal investigator on the Family Exchanges Study which focused on young adults, their midlife parents, and their aging grandparents.

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Table 1.

Sample Characteristics.

Characteristics	*M* (*SD*)	Range	Proportion
Age	73.96 (6.37)	65–89	—
Education[a]	5.88 (1.61)	1–8	—
Overall pain[b]	3.14 (2.73)	0–10	—
Health conditions[c]	2.37 (1.45)	0–7	—
Neuroticism[d]	2.42 (0.69)	1–4.5	—
Female	—	—	.56
Marital status[e]	—	—	.59
Minority status[f]	—	—	.31

Note. For older adults, *n* = 313.

[a] Education was coded 1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *some college/vocation or trade school*, 6 = *college graduate*, 7 = *post college education (but no additional degree)*, and 8 = *advanced degree*.

[b] Overall pain was coded on a 10-category scale, 0 = *no pain* to 10 = *severe pain*.

[c] Health conditions were calculated by summing the number of health problems.

[d] Averaged ratings of 4 neuroticism items on 1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a great deal*.

[e] Marital status was coded 1 = *married/cohabitating*, 0 = *not married*.

[f] Minority status was coded 1 = *ethnic or racial minority*, 0 = *non-Hispanic White*.

Table 2.

Multilevel Models Predicting Older Adult's Pain From Negative Encounters.

Variable	*B*	*SE*
Fixed effects		
Intercept	.15	.31
Between-person effect		
Negative encounters with any social partner[a]	.12	.13
Within-person effect		
Negative encounters with any social partner[a]	.04 **	.02
Covariates		
Age	−.00	.00
Gender[b]	.02	.05
Education[c]	−.01	.02
Marital status[d]	.07	.05
Minority status[e]	−.05	.05
Overall pain[f]	.13 ***	.01
Health conditions[g]	.08 ***	.02
Neuroticism[h]	−.02	.03
Random effects		
Intercept VAR (Level 2: Day)	.12 ***	.01
Intercept VAR (Level 3: Participant)	.00 ***	.00
Residual VAR	.17 ***	.00
−2 (pseudo) log likelihood	7,338.7	

Note. For older adults, *n* = 313. Assessments *n* = 6,262. Pain outcome was coded 0 = *no pain*, 1 = *mild pain*, 2 = *moderate pain*, and 3 *severe pain*. VAR = variance.

[a] 1 = *had negative encounter with any social partner during the prior 3 hr*, 0 = *did not have negative encounter with any social partner during the prior 3 hr*.

[b] 1 = *male*, 0 = *female*.

[c] 1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *some college/vocation or trade school*, 6 = *college graduate*, 7 = *post college education (but no additional degree)*, and 8 = *advanced degree*.

[d] 1 = *married/cohabitating*, 0 = *not married*.

[e] 1 = *ethnic or racial minority*, 0 = *non-Hispanic White*.

[f] Overall pain was coded on a 10-category scale, 0 = *no pain* to 10 = *severe pain*.

[g] Health conditions was calculated by summing the number of health problems.

[h] Averaged ratings of 4 neuroticism items on 1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a great deal*.

*
p < .05.

**
$p < .01$.

***
$p < .001$.

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Table 3.

Multilevel Models Predicting Older Adult's Pain From Negative Encounters With Close and Less Close Social Partners.

Variable	B	SE
Fixed effects		
Intercept	.14	.31
Between-person effect		
Negative encounters with close social partners[a]	.04	.15
Negative encounters with less close partners[b]	.22[*]	.24
Within-person effect		
Negative encounters with close social partners[a]	.03	.02
Negative encounters with less close partners[b]	.05[*]	.02
Covariates		
Age	−.00	.00
Gender[c]	.02	.05
Education[d]	−.01	.02
Marital status[e]	.08	.05
Minority status[f]	−.05	.05
Overall pain[g]	.13[***]	.01
Health conditions[h]	.08[***]	.02
Neuroticism[i]	−.02	.03
Random effects		
Intercept VAR (Level 2: Day)	.12[***]	.01
Intercept VAR (Level 3: Participant)	.00[***]	.00
Residual VAR	.17[***]	.00
−2 (pseudo) log likelihood	7,328.2	

Note. For older adults, $n = 313$. Assessments $n = 6,262$. Pain outcome was coded 0 = *no pain*, 1 = *mild pain*, 2 = *moderate pain*, and 3 *severe pain*. VAR = variance.

[a] 1 = *had negative encounter with any close social partner during the prior 3 hr*, 0 = *did not have negative encounter with any close social partner during the prior 3 hr*.

[b] 1 = *had negative encounter with any less close social partner during the prior 3 hr*, 0 = *did not have negative encounter with any less close social partner during the prior 3 hr*.

[c] 1 = *male*, 0 = *female*.

[d] 1 = *no formal education*, 2 = *elementary school*, 3 = *some high school*, 4 = *high school*, 5 = *some college/vocation or trade school*, 6 = *college graduate*, 7 = *post college education (but no additional degree)*, and 8 = *advanced degree*.

[e] 1 = *married/cohobitating*, 0 = *not married*.

[f] 1 = *ethnic or racial minority*, 0 = *non-Hispanic White*.

[g]Overall pain was coded on a 10-category scale, 0 = *no pain* to 10 = *severe pain*.

[h]Health conditions was calculated by summing the number of health problems.

[i]Averaged ratings of four neuroticism items on 1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *quite a bit*, and 5 = *a great deal*.

[*]$p < .05$.

[**]$p < .01$.

[***]$p < .001$.