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Dispositional Negativity in the Wild: Social Environment Governs Momentary Emotional Experience

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Dispositional negativity—the tendency to experience more frequent or intense negative emotions—is a fundamental dimension of temperament and personality. Elevated levels of dispositional negativity have profound consequences for public health and wealth, drawing the attention of researchers, clinicians, and policymakers. Yet, relatively little is known about the factors that govern the momentary expression of dispositional negativity in the real world. Here, we used smart phone–based experience-sampling to demonstrate that the social environment plays a central role in shaping the moment-by-moment emotional experience of 127 young adults selectively recruited to represent a broad spectrum of dispositional negativity. Results indicate that individuals with a more negative disposition derive much larger emotional benefits from the company of close companions—friends, romantic partners, and family members—and that these benefits reflect heightened feelings of social connection and acceptance. These results set the stage for developing improved interventions and provide new insights into the interaction of emotional traits and situations in the real world, close to clinically and practically important end-points.

Keywords: ecological momentary assessment (EMA), individual differences, neuroticism, personality

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Dispositional negativity—the tendency to experience and express more intense, frequent, or persistent negative affect—is a fundamental dimension of childhood temperament and adult personality (Shack-

man, Tromp, et al., 2016). Elevated levels of dispositional negativity have profound consequences for public health and wealth, drawing the attention of researchers, clinicians, and policymakers. Yet, rela-

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Hudja designed the study. Jennifer S. Weinstein coordinated data collection. Jennifer S. Weinstein, Stanton N. Hudja, and Conor D. Bloomer collected data. Alexander J. Shackman, Jennifer S. Weinstein, and Conor D. Bloomer processed data. Edward P. Lemay developed the MLM analytic strategy and moderated-mediation model. Edward P. Lemay, Alexander J. Shackman, and Matthew G. Barstead analyzed data. Alexander J. Shackman, Edward P. Lemay, Andrew S. Fox, and Matthew G. Barstead interpreted data. Alexander J. Shackman, Edward P. Lemay, Jennifer S. Weinstein, and Andrew S. Fox wrote the paper. Alexander J. Shackman, Andrew S. Fox, and Edward P. Lemay created figures. Edward P. Lemay, Alexander J. Shackman, and Matthew G. Barstead created tables. Alexander J. Shackman funded and supervised all aspects of the study. All authors contributed to reviewing and revising the paper and approved the final version.

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tively little is known about the factors that govern the momentary expression of dispositional negativity in daily life.

Dispositional Negativity

Often termed neuroticism or negative emotionality, dispositional negativity is a trait-like phenotype that first emerges early in development, persists into adulthood, and reflects a combination of genetic and environmental factors (B. W. Roberts et al., 2017; B. W. Roberts & Mroczek, 2008; Soto & John, 2014; Vukasovic & Bratko, 2015). Dispositional negativity is a broad construct that subsumes a number of other, more narrowly focused traits, including behavioral inhibition, neuroticism, self-criticism, trait anxiety, and low self-esteem (Judge, Erez, Bono, & Thoresen, 2002; Mahaffey, Watson, Clark, & Kotov, 2016; Shackman, Tromp, et al., 2016; Stanton, Rozek, Stasik, Ellickson-Larew, & Watson, 2016; Watson, Stanton, & Clark, in press).

Individual differences in dispositional negativity have important consequences for health, wealth, and wellbeing (Shackman, Kaplan, et al., 2016; Shackman, Tromp, et al., 2016). Individuals with a more negative disposition show lower levels of objective socioeconomic attainment (Damian, Su, Shanahan, Trautwein, & Roberts, 2015; Ng, Eby, Sorensen, & Feldman, 2005; Shanahan, Bauldry, Roberts, Macmillan, & Russo, 2014) and experience lower levels of subjective well-being (Steel, Schmidt, & Shultz, 2008). They are more likely to divorce (Karney & Bradbury, 1995), to engage in unhealthy behaviors (Gale et al., 2016; Hakulinen, Hintsanen, et al., 2015; Kotov, Gamez, Schmidt, & Watson, 2010), to develop emotional disorders (Hakulinen, Elovainio, et al., 2015; Jeronimus, Kotov, Riese, & Ormel, 2016; Zinbarg et al., 2016), to become physically ill (Weston, Hill, & Jackson, 2015), and to die prematurely (Chapman, Fiscella, Kawachi, & Duberstein, 2010; Terracciano, Lockenhoff, Zonderman, Ferrucci, & Costa, 2008; R. S. Wilson et al., 2005). As a consequence of these adverse outcomes, dispositional negativity imposes a tremendous burden on global health care systems (Goodwin, Hoven, Lyons, & Stein, 2002; ten Have, Oldehinkel, Vollebergh, & Ormel, 2005) and the economy (Cuijpers et al., 2010).

Dispositional Negativity in the Real World

Despite its profound consequences for health, wealth, and wellbeing, remarkably little is known about the situational factors that govern the expression and experience of dispositional negativity in the real world. To date, most experience-sampling studies have focused on context-independent (i.e., aggregate) measures of positive and negative affect (e.g., Aldinger et al., 2014).¹ A smaller number of studies have highlighted the importance of negative events, showing that dispositionally negative individuals are prone to heightened distress in response to hassles, conflicts, and other daily stressors (e.g., S. L. Gable, Reis, & Elliot, 2000).² For example, Bolger and Zuckerman (1995) used data gleaned from end-of-day diaries to show that young adults with a negative disposition (median split of $n = 94$) report significantly higher levels of depression on days marked by interpersonal conflict. At present, the role of other contextual factors and the consequences for other facets of momentary experience remains rarely explored and poorly understood. Understanding the factors that govern the real-world expression of dispositional negativity is important. The

identification of modifiable targets, such as social context, has the potential to inform the development of scalable, low-cost intervention strategies for a wide range of important public problems and would begin to address fundamental questions about the interaction of personality traits and situations (Caspi, Roberts, & Shiner, 2005).

The Present Study

The widespread dissemination of smart phone technology affords new opportunities for understanding the factors that shape the expression of dispositional negativity in the real world or 'wild.' Here, we used smart phone-based ecological momentary assessment (EMA) to intensively sample key components of momentary emotional experience—including *affect* (positive and negative), *social motivation* (approach and avoidance), and *appraisals about the future* (pessimism and optimism)—in the daily lives of 127 young adults. We focused on young adulthood because it is a time of profound, often stressful developmental transitions (e.g., moving away from home, forging new social relationships; Alloy & Abramson, 1999; Arnett, 2000; Hays & Oxley, 1986). In fact, more than half of undergraduate students report overwhelming feelings of anxiety and more than a third report severe feelings of depression (American College Health Association, 2016), with many experiencing the first onset of psychopathology during this period (Beesdo, Pine, Lieb, & Wittchen, 2010; Fava et al., 2010; Kessler et al., 2005). Because EMA data are captured in the real world, in real time (e.g., *who are you with?*), they circumvent the biases that distort retrospective reports, such as end-of-day diary entries, and can provide insights into how experience dynamically responds to changes in context (Supplementary Figure S1 and Supplementary Table 1; Barrett, 1997; Lay, Gerstorf, Scott, Pauly, & Hoppmann, 2016; Stone, Shiffman, Atienza, & Nebeling, 2007). Subjects were selectively recruited from a much larger pool of previously screened individuals ($n = 2,501$; Figure 1a), which enabled us to characterize relations between a broad spectrum of dispositional negativity (Figure 1b) and fluctuations in momentary experience across different real-world contexts for the first time.

We were particularly interested in understanding the impact of social context. Momentary experience is saturated with emotion, and emotion is profoundly social. Emotional experiences are rou-

¹ See also Brewer et al., 2007; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Ching et al., 2014; Eddington, Majestic, & Silvia, 2012; Emmons & Diener, 1986; Heij & Cheavens, 2014; Hepburn & Eysenck, 1989; Kardum, 1999; Komulainen et al., 2014; Kuppens, Oravecz, & Tuerlinckx, 2010; Kuppens, Van Mechelen, Nezlek, Dossche, & Timmermans, 2007; Lay & Hoppmann, 2014; McConville & Cooper, 1999; Ode, Hilmert, Zielke, & Robinson, 2010; Ong, Zautra, & Reid, 2010; Park, Armeli, & Tennen, 2004; Rusting & Larsen, 1998; Schimmack, 2003; Sherry & Hall, 2009; Skalina, Gunthert, Ahrens, & Wenzel, 2015; Tennen, Affleck, & Zautra, 2006; Tong et al., 2006; Verduyn & Brans, 2012; Watson, 1988; Williams, 1981, 1990; Wilson, Thompson, & Vazire, in press.

² See also Affleck, Tennen, Urrows, & Higgins, 1994; Bolger, DeLongis, Kessler, & Wethington, 1989; Bolger & Schilling, 1991; Bolger & Zuckerman, 1995; Gunaydin, Selcuk, & Ong, 2016; Hankin, Fraley, & Abela, 2005; Howell & Rodzon, 2011; Howland, Armeli, Feinn, & Tennen, 2017; Leger, Charles, Turiano, & Almeida, 2016; Marco & Suls, 1993; Mroczek & Almeida, 2004; O'Hara, Armeli, Boynton, & Tennen, 2014; Rodell & Judge, 2009; Suls, Martin, & David, 1998; Wertz, Armelia, Ford, & Tennen, 2016; Zautra, Affleck, Tennen, Reich, & Davis, 2005.

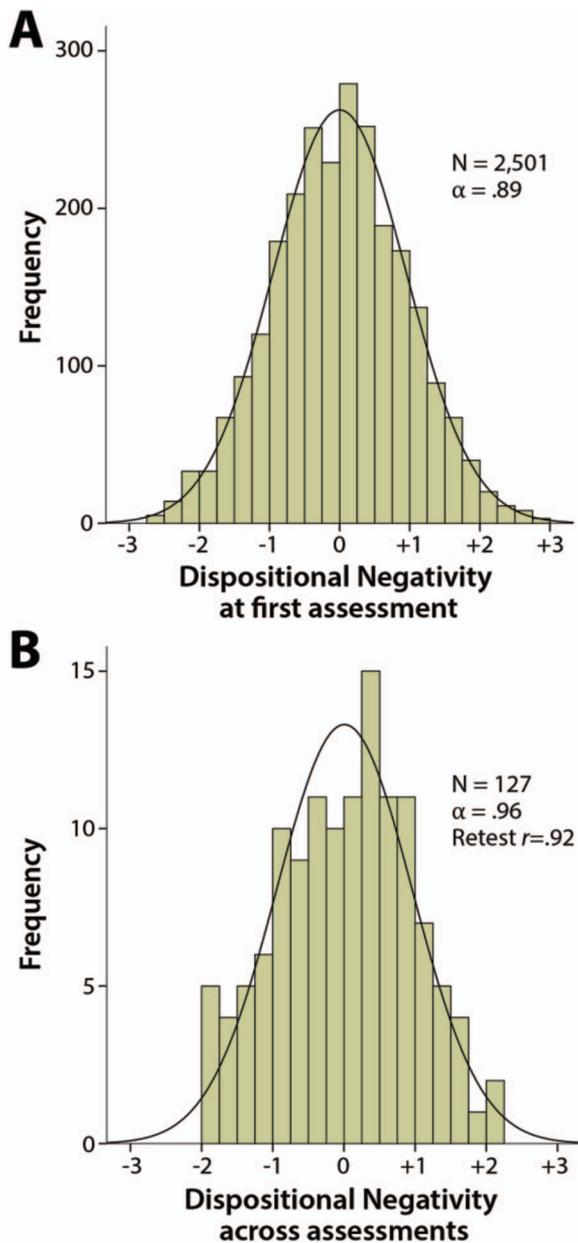


Figure 1. Psychometric characteristics of dispositional negativity. As detailed in the Method section, a composite measure of dispositional negativity was computed using well-established measures of neuroticism (John et al., 2008) and trait anxiety (Goldberg, 1999; Goldberg et al., 2006). (A) Screening sample. The composite measure of dispositional negativity was highly reliable ($\alpha = .89$). Dispositional negativity in the screening sample ($n = 2,501$) was stratified by tertile and sex to produce six sampling strata (not depicted). (B) Ecological momentary assessment (EMA) subsample. For the EMA study ($n = 127$), subjects were independently and randomly recruited from each of the six strata, enabling us to capture a broad range of dispositional negativity while balancing sex. As part of the EMA study, dispositional negativity was assessed a second time. EMA hypothesis testing employed the mean level of dispositional negativity across assessments, minimizing the influence of occasion-specific fluctuations in responding. This composite showed high levels of internal-consistency and test-retest reliability ($\alpha = .96$; $r = .92$; $M = 115.5$ days, $SD = 61.0$ days). See the online article for the color version of this figure.

tinely shared and dissected with close companions, including friends, romantic partners, and family members (Rimé, 2009). Humans and other primates routinely seek the company of close companions in response to stressors (Cottrell & Epley, 1977) and increased social engagement tends to promote positive affect (L. A. Clark & Watson, 1988; Watson, 1988; Watson, Clark, McIntyre, & Hamaker, 1992). Indeed, there is abundant evidence that close companions play a critical role in coping with stress and regulating negative affect (Bolger & Eckenrode, 1991; Buote et al., 2007; Coan & Sbarra, 2015; Marroquin, 2011; Myers, 1999; Zaki & Williams, 2013). In fact, most attempts at emotion regulation occur in social contexts and more frequently involve close companions than strangers or acquaintances (Gross, Richards, & John, 2006).

Using multilevel models (MLMs), we tested two competing predictions about the moment-by-moment interaction of dispositional negativity and the social environment. One possibility is that individuals with a more negative disposition are more dependent on close companions for regulating their chronically elevated distress. Consistent with this possibility, dispositionally negative individuals retrospectively report that they often cope with stress by seeking the comfort, empathy, and emotional support of intimates (Bolger & Zuckerman, 1995; Connor-Smith & Flachsbart, 2007). This motivates the prediction that individuals with a more negative disposition critically rely on and derive larger emotional benefits (e.g., larger decrements in negative affect) from the company of close companions.

Another possibility is that more negative individuals fail to capitalize on available socioemotional support. Consistent with this prediction, individuals with a more negative disposition report lower levels of perceived social support (Bolger & Eckenrode, 1991; Swickert, Hittner, & Foster, 2010) and reduced satisfaction with their close companions (Dyrenforth, Kashy, Donnellan, & Lucas, 2010; Slatcher & Vazire, 2009; R. E. Wilson, Harris, & Vazire, 2015). They tend to behave in ways that promote social discord and rejection (Creed & Funder, 1998; Shackman, Tromp, et al., 2016); to experience more frequent or severe interpersonal conflict (Berry, Willingham, & Thayer, 2000; Brock, Dindo, Simms, & Clark, 2016; Buss, 1991; Donnellan, Larsen-Rife, & Conger, 2005; Hutteman et al., 2014; Kendler, Gardner, & Prescott, 2003; Mehl, Gosling, & Pennebaker, 2006; Robins, Caspi, & Moffitt, 2002); to overreact when conflict does occur (Bolger & Schilling, 1991; Bolger & Zuckerman, 1995); and to experience heightened loneliness (Mund & Neyer, 2016; Pressman et al., 2005; Stokes, 1985). Taken together, these observations motivate the prediction that dispositionally negative individuals derive smaller emotional benefits (e.g., smaller decrements in negative affect) or even costs from the company of close companions.

Using a moderated mediation framework (Hayes, 2013), we also examined whether the interactive effects of dispositional negativity and the environment reflect momentary differences in perceived social connection. Work by our group and others suggests that heightened feelings of social connection, engagement, acceptance, and intimacy are a key feature of high-quality relationships and play an active role in promoting positive affect and buffering stress (Brown, Strauman, Barrantes-Vidal, Silvia, & Kwapił, 2011; M. S. Clark & Lemay, 2010; Coan & Sbarra, 2015; Myers, 1999; Reis & Shaver, 1989; Reis, Sheldon, Gable, Roscoe, & Ryan,

2000). Conversely, low levels of closeness and heightened feelings of loneliness are key risk factors for physical and mental illness (Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015; Coan & Sbarra, 2015; PLoS Medicine Editors, 2010).

Method

Design Overview

As part of an ongoing program of research focused on the etiology of mood and anxiety disorders, we used well-established measures of dispositional negativity (see below) to screen a racially diverse sample of 2,501 young adults in exchange for course extra credit (66.1% female; 56.7% White, 16.0% Asian, 14.7% African American, 6.8% Hispanic, 5.8% Multiracial/Other; $M = 19.8$ years, $SD = 2.6$ years; Figure 1a). Data from the screening assessment were stratified by tertile (high, medium, low) and sex (male, female). For the EMA study, subjects were independently and randomly recruited via email from each of the resulting six strata, enabling us to sample a broad spectrum of dispositional negativity without gaps or discontinuities (Figure 1b), while balancing the inclusion of men and women. Subjects who lacked consistent access to a smart mobile phone were excluded. In practice this never occurred, presumably because of the high rate of smart phone ownership among young adults (i.e., 98.2% of the screening sample). At enrollment, subjects provided informed written consent, were familiarized with the EMA protocol, and recompleted the measures of dispositional negativity. Beginning the next day, subjects completed up to 10 EMA surveys per day for 7 days. At the end of the week, they were debriefed and compensated. All procedures were approved by the University of Maryland Institutional Review Board.

Participants

Six subjects were excluded from analyses due to insufficient compliance with the EMA protocol (<50% completed assessments; see below for additional details). The final EMA sample included 127 young adults (50.4% female; 53.2% White, 15.9% Asian, 13.5% African American, 6.3% Hispanic, 11.1% Multiracial/Other; $M = 20.1$ years, $SD = 1.6$ years) and captured a sizable portion of the dispositional-negativity spectrum, with standardized scores ranging from -1.97 to 2.24 (Figure 1b). The proportion of subjects drawn from each of the sampling strata did not differ, $\chi^2(5) = 2.7$, $p = .75$, indicating similar representation.

Quantifying Dispositional Negativity

We used psychometrically sound measures of neuroticism (Big Five Inventory Neuroticism; John, Naumann, & Soto, 2008) and its anxious facet (International Personality Item Pool Trait Anxiety; Goldberg, 1999; Goldberg et al., 2006) to quantify individual differences in dispositional negativity. Subjects used a 1 (*disagree strongly*) to 5 (*agree strongly*) scale to rate themselves on a total of 18 items (e.g., *depressed or blue, tense, worry, nervous, get distressed easily, fear for the worst, afraid of many things*). At screening ($n = 2,501$), the neuroticism and anxiety scales were strongly correlated ($r = .81$) and reliable ($\alpha s > .82$). A composite measure of dispositional negativity was computed by taking the

mean of the z -transformed scores (range of standardized scores: -2.55 to 2.92 ; $\alpha = .89$; Figure 1a). Among the 127 subjects who successfully completed the EMA study, variation in dispositional negativity displayed good test–retest reliability between the initial screening and a second assessment collected at the start of the week-long EMA study ($r = .92$; $M = 115.5$ days, $SD = 61.0$ days). To minimize the influence of occasion-specific fluctuations in responding, hypothesis testing employed the average level of dispositional negativity across the two assessments (i.e., mean of standardized neuroticism and anxiety scales from both assessments; $\alpha = .96$; Figure 1b).

EMA Procedures

SurveySignal (Hofmann & Patel, 2015) was used to automatically deliver 10 text messages per day to each subject's smart phone. Messages were delivered between 8:30 a.m. and 11:00 PM, with 1–2 hours between successive messages ($M = 86.5$ min, $SD = 14.7$ min). During weekday hours, messages were delivered during the 'passing periods' between scheduled university courses to maximize compliance. Messages contained a link to a secure online survey. Subjects were instructed to respond within 30 min of receiving the message and cautioned to avoid responding at unsafe or inconvenient moments (Latency: *Median* = 3.03 min, *SD* = 15.75 min, *Interquartile range* = 0.85–15.35 min). At enrollment, several well-established procedures were used to maximize compliance (Palmier-Claus et al., 2011). These procedures included (a) delivering a test message to the subject's phone in the laboratory and confirming that they were able to successfully complete the online survey, (b) providing subjects with a 24/7 technical support number, (c) 24-hr and 72-hr check-in calls or emails, (d) real-time monitoring of compliance using the SurveySignal dashboard and recontacting subjects showing low levels of compliance, and (e) monetary bonuses for increased compliance. In the final sample, EMA compliance was acceptable ($M = 78.9\%$, $SD = 10.7\%$) and unrelated to dispositional negativity, $r(125) = -.04$, $p = .69$.³

EMA Survey

The most salient social context was assessed using a forced-choice probe: "Who are you with? (acquaintance(s), strangers, alone, close friend(s), romantic partner, or family)". This was supplemented with two additional *yes/no* probes: "Are you engaged in face-to-face conversation?" and "Are you engaged in a real-time digital (phone, text, Facebook, video) conversation?" Key components of momentary emotional experience were rated using a 1 (*not at all*) to 5 (*very*) scale and included probes of positive affect (*cheerful, happy, joyful*), negative affect (*anxious, nervous, worried*), social approach (*want to be with other people*), social withdrawal (*want to be alone*), optimism (*In the next hour, how positive do you guess the best thing is likely to be?*), pessimism (*In the next hour, how negative do you guess the worst thing*

³ A series of MLM analyses indicated that individual differences in EMA compliance were not significantly related to any of the seven outcome measures (positive affect, negative affect, social approach, social withdrawal, optimism, pessimism, and social engagement), $l_t/s < 1.57$, $p_s > .12$.

is likely to be?), and social engagement (*accepted, connected/engaged*). Subjects were also provided with the opportunity to briefly describe the best and worst event in the prior hour (supplementary Figure S1 and supplementary Table 1).

EMA Data Reduction

Positive affect, negative affect, and social engagement items were averaged separately for each subject and survey. The resulting scales were highly reliable ($\alpha_s > .96$). For social context analyses, assessments completed in the presence of close friends, romantic partners, or family members were recoded as ‘close’ others, whereas assessments completed in the presence of acquaintances or strangers were recoded as ‘distant’ others. This approach is conceptually similar to the distinction between ‘strong’ and ‘weak’ social connections (Granovetter, 1973).

Hypothesis Testing Strategy

Analyses were conducted using SPSS v. 23 (IBM Inc., Armonk, NY). Hypothesis testing focused on six closely related components of momentary emotional experience: *affect* (positive and negative), *motivation* (social approach and avoidance), and *appraisals about the future* (pessimism and optimism). Separate MLMs were computed for each of these outcome measures. Although our primary interest and strongest predictions naturally centered on negative affect, given our focus on dispositional negativity, we reasoned that testing all six measures would provide a more stringent test of our two competing predictions. That is, identifying a convergent pattern of results across the six measures would provide greater confidence than that afforded by any single test.

Hypothesis testing employed MLMs with momentary assessment data nested within subjects. Intercepts were free to vary across subjects. Moment-level predictors were mean-centered separately for each subject. For illustrative purposes, conditional effects are depicted for extreme values ($\pm 1 SD$) of dispositional negativity or perceived social connection (J. Cohen, Cohen, West, & Aiken, 2003).

The interactive effects of Disposition and Social Context (Alone, Distant Others, Close Others) were assessed with MLMs incorporating five predictors: (a) mean-centered Disposition, (b) a dummy variable coding the presence of Distant Others (1 = with distant; 0 = not with distant), (c) a dummy variable coding the presence of Close Others (1 = with close; 0 = not with close), (d) a Disposition \times Distant product term, and (e) a Disposition \times Close product term. In these models, Alone served as the reference category. For example, the coefficient for the Close Others predictor captured the difference between being in the company of close companions versus being alone. Likewise, the coefficient for the Disposition \times Close Others interaction indicates the degree to which the impact of dispositional negativity on momentary experience is conditional on being in the company of intimates compared to being alone. This can also be interpreted as the extent to which the impact of the situation (Close Others vs. Alone) on experience is conditional on disposition. Distant Others was used as the reference category in follow-up analyses. The same general approach was used to assess the influence of perceived social connection.

A moderated mediation framework (Hayes, 2013) was used to test whether the interactive effects of dispositional negativity and

social context reflect momentary differences in perceived social connection. The significance of indirect effects was assessed using a Monte Carlo approach with 10,000 samples (Preacher & Selig, 2012).

Results

Dispositional Negativity Reduces the Quality of Momentary Experience

Higher levels of dispositional negativity had an adverse impact on the quality of momentary experience. Individuals with a more negative disposition tended to experience elevated negative affect, heightened motivation to avoid others, and increased pessimism about the future, $t_s > 4.31$, $b_s > .22$, $p_s < .001$ (Supplementary Tables 2 and 3). Conversely, positive affect and optimism were both reduced, $t_s < -2.22$, $b_s < -.14$, $p_s < .05$. A similar, but not significant effect was found for social approach motivation, $p = .12$. In short, dispositional negativity influences both positive and negative aspects of momentary experience, consistent with prior daily diary and EMA research (e.g., Aldinger et al., 2014; Ching et al., 2014; David, Green, Martin, & Suls, 1997; S. L. Gable et al., 2000; Howell & Rodzon, 2011; Jacobs et al., 2011; Komulainen et al., 2014; Leger et al., 2016; Ong et al., 2010; Skalina et al., 2015; Watson, 1988; Zautra et al., 2005).

The Social Environment Matters—Preliminary Findings

As a precursor to hypothesis testing, we assessed the amount of time that our sample invested in different social environments. As shown in Figure 2, subjects spent more than half their time in the company of others, consistent with other work in young adults (e.g., ~41 hours/week; Berry & Hansen, 1996; Larson, 1990).

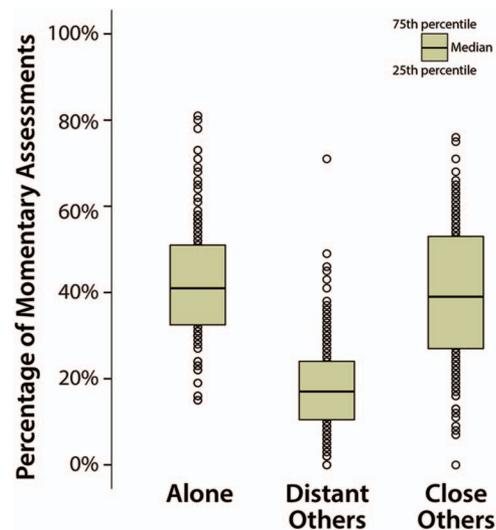


Figure 2. Percentage of momentary assessments completed in each social environment. Rectangles indicate the median and interquartile range. Open circles depict individual subjects. See the online article for the color version of this figure.

Remarkably, on 68.4% of such occasions they were in the presence of close companions, suggesting that friends, romantic partners, and family members are especially well-positioned to influence the quality of momentary emotional experience. Indeed, a regression analysis revealed a dose-dependent effect of time spent with close companions. On average, individuals who spent more time in the company of close companions experienced lower levels of negative affect, higher levels of positive affect, and elevated optimism, $|r(125)| > .20$, $ps < .03$, with no significant effect on pessimism, $p = .15$. In contrast, individuals who spent more time alone experienced higher levels of negative affect, $r(125) = .20$, $p = .03$ (other effects, $ps > .11$).

Figure 2 also makes it clear that there are marked individual differences in the amount of time devoted to each social environment. For example, the interquartile range (depicted in green) for close others extends from 26.7% to 53.1% of assessments (min = 0%; max = 76%). Importantly, dispositional negativity was not significantly related to the amount of time spent alone, with distant others, engaged in face-to-face conversation, or engaged in real-time digital interactions, such as texting, $|r(125)| < .12$, $ps > .19$. There was a trend for individuals with a more negative disposition to spend less time with close others, $r(125) = -.16$, $p > .08$. On balance, these findings suggest that young adults with elevated levels of dispositional negativity are socially active, not isolated, and spend considerable time in the company of intimates. This is consistent with work indicating little to no effect of dispositional negativity on social network size or density (Asendorpf & Wilpers, 1998; Jensen-Campbell et al., 2002; Molho, Roberts, de Vries, & Pollet, 2016; S. G. B. Roberts, Wilson, Fedurek, & Dunbar, 2008; Selfhout et al., 2010; Totterdell, Holman, & Hukin, 2008; Wagner, Ludtke, Roberts, & Trautwein, 2014; Zhu, Woo, Porter, & Brzezinski, 2013), the likelihood of developing friendships in young adulthood (Selfhout et al., 2010), the frequency of social interactions (Watson et al., 1992), or the frequency of desirable daily events with family and friends (David et al., 1997).

Close Companions Enhance the Quality of Momentary Experience

Consistent with our preliminary results, MLM analyses provided additional evidence that the social environment is a key determinant of intraindividual differences in momentary emotional experience (Figure 3 and Table 1). Relative to solitary contexts, the presence of close companions was associated with significantly lower levels of negative affect, social avoidance, and pessimism, $ps < .001$. Likewise, being in the company of close companions was associated with higher levels of positive affect, social approach, and optimism, $ps < .001$, replicating and extending the results of prior diary (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004; Krueger, Kahneman, Schkade, Schwartz, & Stone, 2009; Watson, 1988; Watson et al., 1992) and EMA studies (Csikszentmihalyi & Hunter, 2003; Larson, 1990; Weinstein & Mermelstein, 2007). A similar, but weaker pattern of effects was found for distant companions—only three of the six outcome measures were significant (Table 1). Follow-up analyses revealed that, relative to distant others, the company of close companions is associated with significant decrements in the three measures of negative experience and significant increments in the three measures of positive experience, $ps < .001$. This pattern of findings

underscores the potent effects of close companions on real-world emotional experience.

The Impact of Dispositional Negativity on Momentary Experience Strongly Depends on Social Context

MLM analyses also demonstrated that the adverse impact of dispositional negativity on momentary experience is conditional on the social environment (Figure 3). Individuals with higher levels of dispositional negativity reap much larger emotional benefits from the company of close companions when compared to assessments when they were alone or when compared to those with low levels of dispositional negativity ($ps < .05$ for all six outcome measures; Tables 1 and 2). These effects were specific to close companions. None of the Disposition \times Distant Others interactions were significant in the omnibus model (Table 1) and the Disposition \times Close Others interaction remained significant for all six outcome measures when we incorporated Distant Others as the reference category, $ps < .02$. Taken together, these observations show that close companions are an important and beneficial governor of momentary emotional experience for individuals with a more negative disposition, consistent with our first competing prediction.⁴

The Impact of Close Companions Reflects Heightened Feelings of Social Connection

Momentary fluctuations in the social environment determine perceived social connection. The results described so far indicate that close companions—friends, romantic partners, and family members—have a deeply positive influence on momentary experience and that this is particularly evident for individuals with a more negative disposition. But does this reflect heightened feelings of social connection, engagement, and acceptance? Consistent with this possibility, preliminary MLM analyses showed that fluctuations in the social environment parametrically determine the degree of perceived social connection (i.e., Close Others $>$ Distant Others $>$ Alone)—subjects felt more connected in the company of intimates compared to distant others and more connected in the company of distant others compared to being alone ($ts > 11.86$, $bs > .31$, $ps < .001$).

Individuals with a more negative disposition experience amplified feelings of social connection with close companions. Next, we used a moderated mediation framework to test whether the joint influence of dispositional negativity and social context on momentary experience reflects differences in perceived social connection (Figure 4; Hayes, 2013). Put another way, individuals with a more negative disposition derive significantly larger emotional benefits from the company of intimates—but can this be explained by heightened feelings of social connection?

As a first step, we tested whether dispositional negativity and social context jointly determine feelings of social connection (Dis-

⁴ Control analyses indicated that these effects were not due to differential contact with close companions. When we expanded the MLM to include the frequency of assessments with Close Others and the frequency of assessments with Distant Others (including appropriate product terms), the Disposition \times Close Others interaction remained significant for all six outcome measures, $ps < .02$.

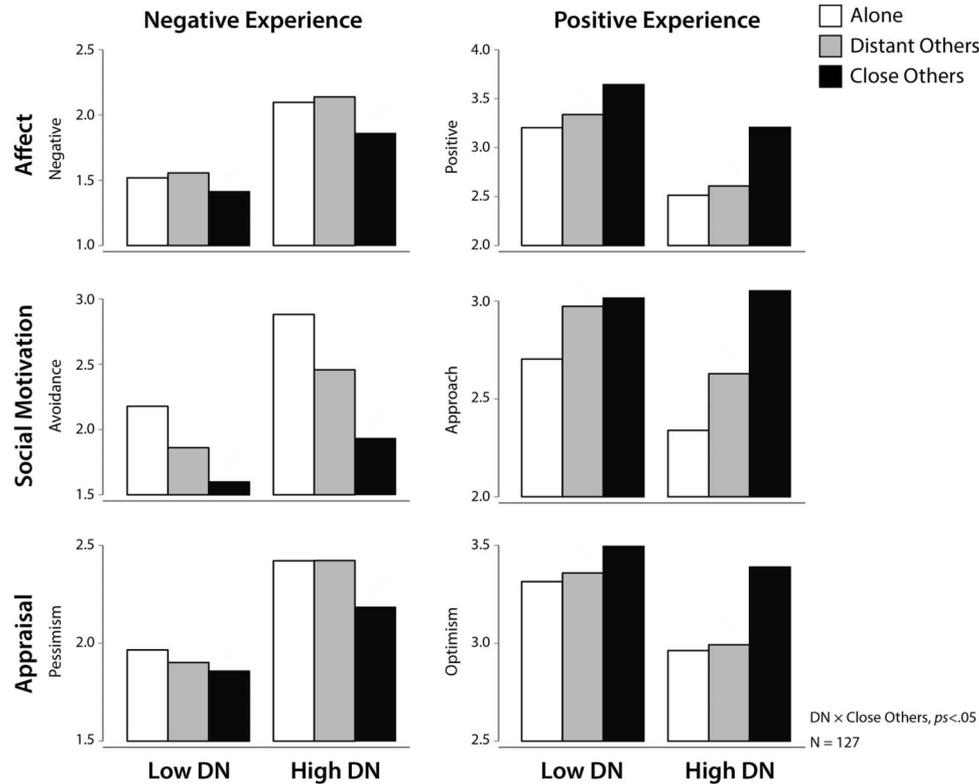


Figure 3. Ecological momentary assessment (EMA) demonstrates that the deleterious impact of dispositional negativity on momentary experience critically depends on social context. Individuals with high levels of dispositional negativity reap larger benefits—larger decrements in negative experience (left side of display) and larger increments in positive experience (right side of display)—from the company of Close Others (black bars), relative to being Alone (white bars). See Table 1 and supplementary Table 2 for detailed results. Follow-up analyses demonstrated that the presence of Close Others provided significantly greater benefits than Distant Others. Hypothesis testing relied on a continuous measure of dispositional negativity. For illustrative purposes, predicted values derived from the multilevel models (MLMs) are depicted for extreme levels (± 1 SD). DN: Dispositional negativity.

position \times Context \rightarrow Connection; path b in Figure 4). In fact, both the Disposition \times Close ($t = -2.15$, $b = -.06$, $p < .05$) and Disposition \times Distant, $t = 6.78$, $b = .16$, $p < .001$ interactions were significant ($|r| > 2.14$, $|b| > .05$, $ps < .05$; Figure 5). Higher levels of dispositional negativity are associated with lower levels of social connection when alone (white bars in Figure 5) or with distant others (gray bars in Figure 5; $ts < -4.36$, $bs < -.28$, $ps < .001$). This detrimental effect is nearly abolished in the company of close others (black bars in Figure 5; $t = -1.95$, $b = -.13$, $p =$

.053). Importantly, while the company of close companions is associated with heightened feelings of social connection (compared to being alone), this effect was much stronger for individuals with high compared to low levels of dispositional negativity (black and white bars in Figure 5; $t = 30.19$, $b = .96$, $p < .001$ vs. $t = 21.22$, $b = .65$, $p < .001$).

Individuals with a more negative disposition experience attenuated feelings of social connection with distant companions. Interestingly, this pattern was reversed for distant others (gray and

Table 1
The Impact of Dispositional Negativity and Social Context on Momentary Emotional Experience

Variable	Negative affect		Social avoidance		Pessimism		Positive affect		Social approach		Optimism	
	t	b	t	b	t	b	t	b	t	b	t	b
Dispositional negativity	+6.15***	+.30	+5.96***	+.37	+4.44***	-.24	-5.00***	-.36	-2.45*	-.19	-2.79**	-.19
Distant others	+1.61	+.04	-10.90***	-.37	-1.06	-.03	+4.23***	-.11	+8.00***	+.28	+1.21	+.04
Close others	-8.69***	-.17	-28.19***	-.76	-7.23***	-.17	26.16***	+.57	18.37***	+.51	12.50***	+.30
Disposition \times Distant	+.08	+.00	-1.63	-.06	+1.13	+.03	-.78	-.02	+.28	+.01	-.25	-.01
Disposition \times Close	-3.15**	-.07	-6.53***	-.19	-2.57*	-.07	+5.57***	+.13	+6.87***	+.21	+4.87***	+.13

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2
Simple Effects Used to Decompose the Disposition \times Close Others Interaction

Variable	Negative affect		Social avoidance		Pessimism		Positive affect		Social approach		Optimism	
	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>
Dispositional negativity, Alone	+6.15***	+.30	+5.96***	+.37	+4.44***	+.24	-5.00***	-.36	-2.45*	-.19	-2.79**	-.19
Dispositional negativity, Close others	+4.74***	+.24	+2.81**	+.18	+3.17**	+.17	-3.16**	-.23	+.24	-.02	-.83	-.06
Close others vs. Alone, Low dispositional negativity	-3.80***	-.11	-15.02***	-.58	-3.20**	-.11	14.29***	+.44	+7.87***	+.31	+5.21***	+.18
Close others vs. Alone, High dispositional negativity	-8.16***	-.24	-23.84***	-.95	-6.75***	-.24	21.76***	+.69	17.39***	+.71	11.97***	+.43

* $p < .05$. ** $p < .01$. *** $p < .001$.

white bars in Figure 5). On average, the presence of distant others was associated with increased feelings of social connection relative to solitary contexts, but here the effect was weaker for individuals with high levels of dispositional negativity compared with those with low levels ($t = 7.21, b = .26, p < .001$ vs. $t = 9.71, b = .38, p < .001$). To further clarify the specificity of these effects, we recomputed the MLM using close others as the reference group. This revealed a significant Disposition \times Distant interaction ($t = -7.71, b = -.22, p < .001$), indicating that the benefits of close (compared to distant) companions are magnified for individuals with a more negative disposition. Collectively, these results indicate that individuals with a more negative disposition are hyper-sensitive to some aspects of the social environment, experiencing amplified feelings of social connection in the company of intimates and attenuated feelings of social connection in the presence of acquaintances and strangers.

Perceived social connection moderates the impact of dispositional negativity on momentary experience. Next, we tested whether heightened feelings of social connection moderate the

deleterious impact of dispositional negativity on momentary experience (Disposition \times Connection \rightarrow Experience; path *c* in Figure 4). As detailed in Table 3, the interaction was significant for all six measures of momentary experience. This result, which reflects assessments of psychological experience (i.e., *How accepted, connected, and engaged do you feel?*) rather than social context (e.g., *Who are you with?*), is particularly important because it independently confirms the exaggerated significance of social experience for individuals endowed with a more negative disposition. Furthermore, in these simultaneous MLMs, the Disposition \times Close interaction was no longer significant for four of the outcome measures (negative affect, pessimism, positive affect, and optimism) and was substantially weaker for social avoidance and approach (compare Table 3 to Table 2), underscoring the importance of perceived social connection (Cacioppo et al., 2015; Stokes, 1985) and consistent with the hypothesized moderated mediation model.

As shown in Figure 6 and Table 4, simple effects analyses yielded two additional conclusions. First, the adverse influence of dispositional negativity on momentary experience is reduced (i.e., the regression slope is flatter) in moments when perceived social connection is high (solid line) relative to when it is low (broken line). This is particularly evident for negative affect, social avoid-

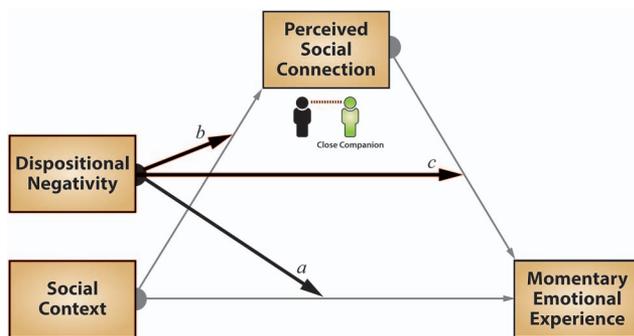


Figure 4. Moderated mediation framework. Our results demonstrate that dispositional negativity and social context interactively determine the quality of momentary experience (path *a*). Individuals with a more negative disposition derive larger emotional benefits from the company of close companions. Elevated levels of dispositional negativity are associated with a reduction in the quality of momentary emotional experience, but the presence of other individuals, especially close companions, markedly attenuates this association. We hypothesized that this 'buffering' effect reflects momentary variation in the degree of perceived social connection. A moderated mediation framework was used to assess specific aspects of this hypothesis (e.g., paths *b* and *c*; Hayes, 2013). Black paths indicate moderation and gray paths indicate mediation. See the online article for the color version of this figure.

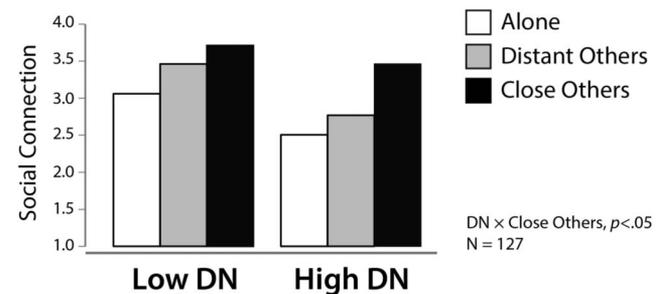


Figure 5. The deleterious impact of dispositional negativity on perceived social connection is conditional on social context. multilevel models (MLM) results indicate that individuals with a more negative disposition are hyper-sensitive to the social environment, experiencing amplified feelings of social connection in the company of Close Others (black bars) relative to Alone (white bars) and attenuated feelings of social connection in the presence of Distant Others (gray bars) relative to Alone (white bars). Hypothesis testing relied on a continuous measure of dispositional negativity. For illustrative purposes, predicted values are depicted for extreme levels (± 1 SD). DN: Dispositional negativity.

Table 3
The Impact of Dispositional Negativity, Social Context, and Perceived Social Connection on Momentary Emotional Experience

Variable	Negative affect		Social avoidance		Pessimism		Positive affect		Social approach		Optimism	
	<i>t</i>	<i>b</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>
Dispositional negativity	+5.54***	+.28	+5.19***	+.33	+3.78***	+.20	-4.53***	-.30	-2.04***	-.16	-2.39***	-.16
Distant others	+3.42**	+.08	-7.96***	-.26	-1.10	-.03	-4.90***	-.10	4.41***	.15	2.63**	.08
Close others	-2.00*	-.04	-16.50***	-.47	-.42	-.01	1.15	.02	5.76***	.17	.39	.01
Disposition × Distant	+.40	+.01	-1.68	-.06	+1.39	+.04	+.55	+.01	.69	.02	.11	.00
Disposition × Close	+.47	+.01	-2.19*	-.07	+1.20	+.03	+.19	.00	3.17**	.10	1.37	.04
Connection	-13.71***	-.15	-24.36***	-.36	-16.37***	-.22	75.19***	+.68	28.60***	+.42	27.77***	+.36
Disposition × Connection	-5.88***	-.07	-5.61***	-.09	-5.91***	-.08	+3.60***	+.03	+3.38**	+.05	3.17**	.04

* $p < .05$. ** $p < .01$. *** $p < .001$.

ance, and pessimism. Second, individuals with a more negative disposition derive larger emotional benefits from perceptions of social connection compared to those with a less negative disposition (i.e., the difference between the solid and broken lines is magnified at high levels of negativity). These results suggest that the emotional benefits that dispositionally negative individuals derive from the company of close others (Figure 3) and, to a lesser degree distant others, are largely explained by heightened feelings of social engagement and acceptance (Figure 6), rather than some other context-dependent variable (e.g., activity).

Heightened social connection mediates the impact of close companions on momentary experience. Finally, we formally assessed whether the impact of close companions on momentary emotional experience is statistically mediated by heightened feelings of social connection. Using well-established Monte Carlo techniques (Preacher & Selig, 2012), we estimated 95% confidence intervals (CIs) for the indirect effect of connection (i.e., Close Others → Connection → Experience; gray paths in Figure 4). As detailed in Table 5, the emotional benefits of close companions were significantly mediated by heightened feelings of social connection for all six outcome measures (i.e., the 95% CIs did not include 0), $ps < .05$. Critically, the 95% CIs for individuals with high levels of dispositional negativity (upper row of Table 5) were more extreme and did not overlap those for individuals with low levels of dispositional negativity (lower row of Table 5), indicating stronger mediation effects. Taken together, these results indicate that individuals with a more negative disposition derive larger emotional benefits from the company of close companions in their daily lives and that these benefits reflect heightened feelings of social connection (Figure 3b).

Discussion

Elevated levels of dispositional negativity confer increased risk for a broad spectrum of adverse outcomes, from divorce and mental illness to physical disease and death. The present study provides new insights into how the social environment shapes the momentary experience and expression of dispositional negativity in the real world, close to these important end points. On average, individuals with a more negative disposition experienced substantially higher levels of negative affect, avoidance motivation, and pessimism and lower levels of positive affect, approach motivation, and optimism in their daily lives (Supplementary Tables 2 and 3), replicating and extending prior experience-sampling work

focused on context-independent positive and negative affect. EMA data provide unique evidence that this effect is largely unrelated to the amount of time budgeted to particular social environments.⁴ Like many other young adults (Figure 2), dispositionally negative individuals spend the majority of their waking hours in the company of others. This suggests that objective social isolation, avoidance, or other kinds of context-selection effects are not core determinants of their momentary emotional experience, at least during this phase of development (Qualter et al., 2015). Instead, our results highlight the key role that close companions—friends, romantic partners, and family members—play in moderating momentary emotional experience (Figure 3) and show that this is particularly evident among individuals marked by high levels of dispositional negativity. In fact, these results show that dispositionally negative individuals derive substantially larger emotional benefits—lower levels of negative affect, avoidance motivation, and pessimism and higher levels of positive affect, approach motivation, and optimism—from the company of close companions relative to the company of strangers or acquaintances, to solitary contexts, or to individuals with a less negative disposition (Figure 3). Moreover, the results of our mediation analyses indicated that these enhanced emotional benefits reflect exaggerated feelings of social connection and acceptance in the presence of intimates (Figures 4 and 5). In short, moment-by-moment fluctuations in perceived social connection play a key role in governing the expression and experience of dispositional negativity in daily life. These results provide a novel framework for understanding the processes that contribute to the development of mental illness and other adverse outcomes linked to dispositional negativity, for guiding the development of improved intervention strategies, and for clarifying the interplay of personality and the environment.

The present observations complement a growing body of laboratory evidence highlighting the importance of social and interpersonal processes for emotion regulation (Coan & Sbarra, 2015; Gable & Reis, 2010; Lakey & Orehek, 2011; Zaki & Williams, 2013). Our results suggest that individuals with a more negative disposition are particularly dependent on intimate companions for regulating their persistently elevated distress. Indeed, inspection of Figure 3 indicates that the emotional experience of high-negative individuals most closely resembles that of low-negative individuals when they are in the company of their close companions, particularly for positive facets of momentary experience (e.g., optimism about the future). A broadly similar pattern has been

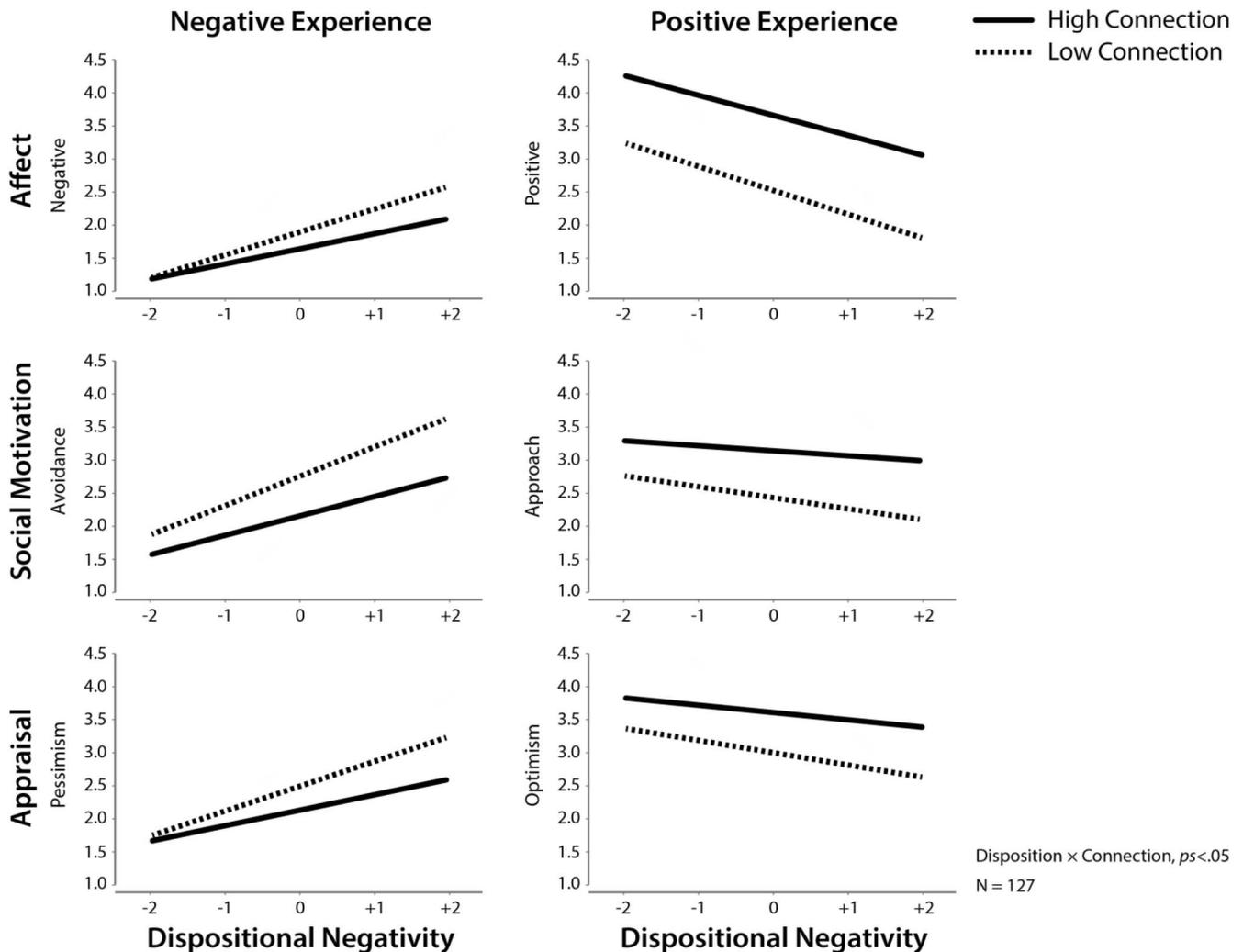


Figure 6. Momentary fluctuations in perceived social connection govern the adverse impact of dispositional negativity on emotional experience. Simple effects analyses demonstrated that the adverse impact of dispositional negativity on momentary experience is attenuated—the regression slope is flatter—during moments when social connection was high (solid line) relative to when it was low (broken line), particularly for negative affect, social avoidance, and pessimism. Individuals with a more negative disposition derive larger emotional benefits from perceived social connection compared to those with a less negative disposition (i.e., the difference between the solid and broken lines is magnified at high levels of negativity). See Tables 3 and 4 for detailed results. Hypothesis testing relied on continuous measures of social connection and dispositional negativity. For illustrative purposes, predicted values are depicted for extreme levels (± 1 *SD*) of social connection.

observed in several randomized laboratory studies, suggesting that close companions play a causal role in normalizing emotional experience. For example, the presence of a close companion has been shown to normalize negative affect and catastrophic cognitions (“I’m going to die”) in panic disorder patients exposed to a panic-inducing CO₂ challenge (Carter, Hollon, Carson, & Shelton, 1995) and to normalize behavioral signs of anxiety in socially anxious young adults during a videotaped speech challenge (Pontari, 2009). More naturalistic research indicates that dispositionally negative individuals are characterized by poor emotion regulation skills (Suls & Martin, 2005) and are prone to coping with stress by seeking the emotional support of intimates (Bolger & Zuckerman,

1995; Connor-Smith & Flachsbart, 2007). Observational studies of married couples show that individuals with a more negative disposition solicit and receive more socioemotional support from their spouses (Pasch, Bradbury, & Davila, 1997; Wang & Repetti, 2014) and diary studies of anxiety patients suggest that enhanced spousal support dampens negative affect (Zaider, Heimberg, & Iida, 2010). Collectively, this body of observations suggests that friends, romantic partners, and family members serve as a regulatory ‘prosthesis’ for dispositionally negative individuals.

Relying on intimates for emotion regulation is risky. This is particularly true for dispositionally negative individuals, who tend to behave in ways that promote interpersonal conflict, social re-

Table 4
Simple Effects Used to Decompose the Disposition \times Social Connection Interaction

Variable	Negative affect		Social avoidance		Pessimism		Positive affect		Social approach		Optimism	
	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>
Dispositional negativity at low connection	6.88***	.34	5.73***	.36	5.58***	.30	-4.90***	-.36	-2.10*	-.16	-2.75**	-.18
Dispositional negativity at high connection	4.54***	.22	3.40**	.21	2.98**	.16	-4.10***	-.30	-.95	-.07	-1.64	-.11
Connection at low dispositional negativity	-5.08***	-.08	-12.27***	-.27	-6.81***	-.14	47.01***	+.64	16.55***	+.37	16.13***	+.32
Connection at high dispositional negativity	-14.90***	-.22	-22.75***	-.44	-16.93***	-.29	59.64***	+.71	24.24***	+.47	23.46***	+.40

* $p < .05$. ** $p < .01$. *** $p < .001$.

jection, and the dissolution of close relationships (Karney & Bradbury, 1995; Robins et al., 2002). Relationship distress and dissolution reduces or eliminates the possibility of interpersonal emotion regulation and, ultimately, can contribute to the development and maintenance of anxiety disorders, depression, and substance abuse (Baucom, Belus, Adelman, Fischer, & Paprocki, 2014; Marroquin, 2011; Rehman, Gollan, & Mortimer, 2008; Whisman & Baucom, 2012). Even in the absence of relationship problems, as young adults transition to full-time employment, marriage, and parenting, social network size begins to decline and more time is spent alone (Larson, 1990; Wrzus, Hanel, Wagner, & Neyer, 2013; Wrzus, Wagner, & Riediger, 2016), particularly among those who are single or widowed (Larson, 1990). Many middle-aged and older adults report that they have no confidant (McPherson, Smith-Lovin, & Brashears, 2006), depriving them of opportunities for interpersonal emotion regulation. This is likely to be exacerbated among individuals with a more negative disposition, who report fewer confidants by midlife (Kendler et al., 2003).

From an intervention perspective, these observations suggest that naturally occurring social relationships represent an important target for a range of adverse outcomes, including marital problems, emotional disorders, and stress-sensitive illness (S. Cohen, 2004; PLoS Medicine Editors, 2010). Existing treatments for extreme dispositional negativity typically focus on the individual (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014), but our results highlight the value of simultaneously considering the role of close companions (Baucom et al., 2014) and developing interventions to enhance social connection, acceptance, and support. This could take the form of nurturing social-cognitive skills, cultivating stronger and more frequent ties with existing companions and social networks (e.g., reduce overreliance on a particular intimate), or reducing maladaptive thoughts and behaviors that promote conflict and rejection (Cacioppo et al., 2015; Kok & Singer, 2017; Masi, Chen, Hawkey, & Cacioppo, 2011). The development of

smart phone-based interventions would provide a scalable and cost-effective alternative to more traditional modalities (e.g., cognitive-behavioral therapy; Eapen & Peterson, 2015; Hampton, 2012; Kazdin & Blase, 2011a, 2011b; Kramer et al., 2014; World Health Organization, 2013) and may be especially effective for the sizable number of individuals who are unable or unwilling to use traditional treatments (Mojtabai et al., 2011). Smart phone-based interventions have a number of other potential advantages, including opportunities for personalized treatment, real-time monitoring of treatment outcomes, and increased engagement (Klasnja & Pratt, 2012).

Our findings also have implications for theories of temperament and personality. Dispositional negativity is usually cast as an increased sensitivity to aversive challenges and psychological pathogens (e.g., conflict, punishment, stress, and threat). From this perspective, dispositional negativity represents a diathesis that promotes heightened levels of negative affect, pessimism, and avoidance motivation in the face of trait-relevant challenges (Eysenck, 1967; Gray & McNaughton, 2000; Kagan, Reznick, & Snidman, 1988; Spielberger, 1966; Zuckerman, 1976). The present results and other data (e.g., Aldinger et al., 2014; Ching et al., 2014; David et al., 1997; Emmons & Diener, 1986; S. L. Gable et al., 2000; Howell, Ksendzova, Netingen, Yerahian, & Iyer, in press; Howell & Rodzon, 2011; Jacobs et al., 2011; Komulainen et al., 2014; Kuppens et al., 2007; Lay & Hoppmann, 2014; Leger et al., 2016; Snippe et al., 2017; Soto & John, 2016; Tennen et al., 2006; Watson, 1988; Watson & Clark, 1984; Wilson et al., in press; Zautra et al., 2005) underscore the need to broaden this perspective to encompass positive affect and positive experiences. First, our results highlight the substantial, but often overlooked influence of dispositional negativity on positive features of momentary experience, including lower levels of positive affect, optimism, and approach motivation (Figure 3). There is abundant evidence that dispositional negativity confers increased risk for the

Table 5
Monte Carlo Tests of Mediation (95% Confidence Intervals for the Indirect Effect)

Variable	Negative affect	Social avoidance	Pessimism	Positive affect	Social approach	Optimism
High dispositional negativity	-.24 to -.18*	-.47 to -.38*	-.32 to -.24*	.63 to .73*	.41 to .50*	.34 to .42*
Low dispositional negativity	-.08 to -.04*	-.21 to -.15*	-.12 to -.06*	.38 to .46*	.21 to .28*	.18 to .24*

Note. Indirect effect.

* $p < .05$ based on 20,000 samples.

development of mood disorders (Hengartner, Ajdacic-Gross, Wyss, Angst, & Rossler, 2016; Laceulle, Ormel, Vollebergh, van Aken, & Nederhof, 2014; Naragon-Gainey & Watson, 2014; Ormel et al., 2013; Zinbarg et al., 2016) and these moment-by-moment relations may provide an anhedonic pathway for the development of pathological depression. Second, our results make it clear that individuals with a more negative disposition are not just hyper-sensitive to threat, they are also differentially sensitive to the company of intimates and to environments that elicit feelings of connection, acceptance, and intimacy (Figure 5). Our observations may also provide insights into the mechanisms underlying long-term changes in dispositional negativity. Like other core emotional traits, dispositional negativity is somewhat malleable and continues to evolve across the life span (Fraley & Roberts, 2005; B. W. Roberts & DelVecchio, 2000; B. W. Roberts et al., 2017; B. W. Roberts & Mroczek, 2008; B. W. Roberts, Walton, & Viechtbauer, 2006). Longitudinal studies demonstrate that changes in the social environment (e.g., death of a spouse, remarriage following widowhood, or gradual shifts in marital satisfaction) are associated with long-lasting changes in dispositional negativity (Mroczek & Spiro, 2003; B. W. Roberts & Chapman, 2000; Scollon & Diener, 2006), but the proximal mechanisms have remained unclear. The present results motivate the hypothesis that these changes in emotional disposition reflect the cumulative impact of long-term alterations in the social regulation of momentary experience.

Our results highlight some other valuable avenues for future research. In particular, the present study provides scant information about the social networks in which dispositionally negative individuals are embedded. For example, we do not know whether more negative individuals rely on many or few close companions. Another key challenge is to discover the specific interactional processes that underlie heightened feelings of social connection and acceptance (Caspi et al., 2005). Observational and experimental studies of dyadic interactions would be particularly valuable for identifying mechanistically important social processes and these could be combined with EMA procedures to establish their relevance to real-world experience. Intervention studies would afford a crucial opportunity to test whether the relations that we have identified are causally important.

In sum, the present study suggests that intimate companions play a vital role in governing the momentary expression and experience of dispositional negativity in the real world. Our results indicate that individuals with a more negative disposition derive enhanced emotional benefits from close companions and that these benefits reflect heightened feelings of social connection. The results set the stage for developing improved strategies for treating or even preventing the deleterious consequences of extreme dispositional negativity. More broadly, they provide new insights into the ways in which traits and situations interactively regulate momentary emotional states.

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Supplementary results to accompany—

Dispositional negativity in the wild: *Social context governs momentary emotional experience*

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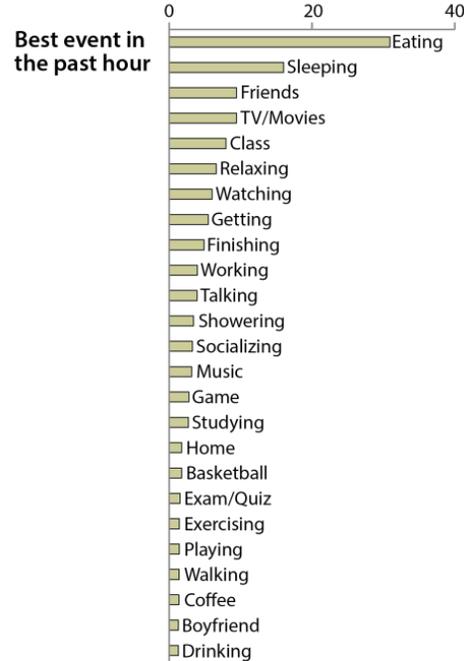
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Top 25 events (standardized frequency)



Supplementary Figure S1. EMA reveals the factors that dynamically influence moment-by-moment experience. At each assessment, subjects were given the opportunity to briefly describe the best and worst event in the past hour (see Supplementary Table 1 for data from a representative subject). For illustrative purposes, the resulting database of words was minimally processed to remove typographic errors, apply common tenses to verbs, and censor common words (e.g., 'and') and then ranked according to the z-transformed number of occurrences.



Supplementary Table 1. Open-ended responses from a representative subject.

Day	Time	Worst event in the past hour?	Best event in the past hour?
Thursday	10:51	<i>Both dorm bathrooms were occupied</i>	<i>Waking up refreshed</i>
	12:20	<i>Walked in 2 min late for class</i>	<i>Watched movie in class</i>
	14:01	<i>Laptop keeps freezing</i>	<i>Got time to relax</i>
	15:30	<i>Trouble falling asleep</i>	<i>Napping</i>
	16:57	<i>Had to talk about myself</i>	<i>Got to talk about myself</i>
	19:25	<i>Had to wait long time for food</i>	<i>Dinner with roommate</i>
	20:58	<i>Getting into argument with boyfriend</i>	<i>Coming home from school</i>
	22:26	<i>Not being able to find the box to find warranty info about my laptop</i>	<i>Finding out my broken laptop has been partially fixed</i>
Friday	14:07	<i>Stubbed toe</i>	<i>Repairs on my computer complete</i>
	14:54	<i>Got hungry</i>	<i>Doing hobby</i>
	19:51	<i>Overpaid for an item</i>	<i>Hung out with best friend</i>
	21:03	<i>Stomach ache</i>	<i>Dinner with family</i>
	22:31	<i>Tummy ache</i>	<i>Hanging out with best friend</i>
Saturday	14:15	<i>Over slept</i>	<i>Woke up next to boyfriend</i>
	15:21	<i>Have to do homework</i>	<i>Motivated to do homework</i>
	16:45	<i>Have to do homework</i>	<i>Ate lunch</i>
	18:14	<i>Got tired</i>	<i>Finished homework</i>
	19:57	<i>Bit tongue</i>	<i>Spent time with Mom</i>
	21:22	<i>Got sleepy</i>	<i>Finished/beat my video game</i>
	22:34	<i>Have to do homework</i>	<i>Motivated to do homework</i>
Sunday	14:10	<i>Sleep in too long</i>	<i>Sleep in</i>
	15:24	<i>Have to study for exam</i>	<i>Got studying done</i>
	17:05	<i>Realized it was day light savings-- lost an hour</i>	<i>Got cuddles</i>
	18:26	<i>Fight with boyfriend</i>	<i>Refreshing shower</i>
	19:57	<i>Argument with boyfriend</i>	<i>Did something outside of house</i>
	22:52	<i>Have more homework</i>	<i>Friend came over</i>
Monday	12:16	<i>Missed class</i>	<i>Woke up</i>
	13:52	<i>Still feel guilty for missing class</i>	<i>Got homework done</i>
	14:52	<i>Have a lot more work to do</i>	<i>Got a lot of work done</i>
	18:15	<i>Hit traffic on way to school</i>	<i>Had good class discussion</i>
	19:39	<i>Got hungry</i>	<i>Hung out with close friend</i>
	21:01	<i>Had to drive home</i>	<i>Got to see old friend</i>

	22:30	<i>Have to do homework now</i>	<i>Ate at favorite restaurant</i>
Tuesday	17:09	<i>Spent a lot of money</i>	<i>Got new shoes</i>
	20:43	<i>Getting tired</i>	<i>Felt prepared for exam</i>
	22:33	<i>Feeling nervous for exam tomorrow</i>	<i>Played new video game</i>
Wednesday	12:07	<i>Had to take exam</i>	<i>Finished exam</i>
	18:18	<i>Getting tired</i>	<i>Good class</i>
	21:15	<i>Had to ride bus home</i>	<i>Came home</i>

Supplementary Table 2. *The main effect of dispositional negativity on momentary emotional experience.*

Negative Affect		Social Avoidance		Pessimism		Positive Affect		Social Approach		Optimism	
<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>
5.85***	.28	4.75***	.30	4.32***	.23	-4.55***	-.33	-1.57	-.12	-2.23*	-.15

*** $p < .001$. ** $p < .01$. * $p < .05$

Supplementary Table 3. *Descriptive statistics for extreme groups^a.*

	Negative Affect		Social Avoidance		Pessimism		Positive Affect		Social Approach		Optimism		Connection	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
High DN	2.22	1.12	2.88	1.39	2.42	1.17	2.56	1.12	2.49	1.26	3.02	1.14	2.72	1.18
Middling DN	1.72	0.86	2.08	1.21	2.14	1.01	3.09	1.12	2.80	1.32	3.25	1.12	3.15	1.11
Low DN	1.36	0.66	1.77	0.99	1.67	0.81	3.74	1.14	3.00	1.29	3.56	1.11	3.66	1.05

^a For descriptive purposes, extreme groups were formed from individuals who were 1 *SD* above (High DN; $n = 21$) or below (Low DN; $n = 20$) the mean level of dispositional negativity (DN). The remaining subjects were assigned to the Middling DN group ($n = 86$). Dependent measures range from 1 (*not at all*) to 5 (*very*).