Published in final edited form as:
Ann Behav Med. 2013 February ; 45(1): 110–120. doi:10.1007/s12160-012-9423-0.

Affective reactivity to daily stressors and long-term risk of reporting a chronic physical health condition

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Abstract

Background—Daily stressors, such as an argument with a spouse or an impending deadline, are associated with short-term changes in physical health symptoms. Whether these minor hassles have long-term physical health ramifications, however, is largely unknown.

Purpose—The current study examined whether exposure and reactivity to daily stressors is associated with long-term risk of reporting a chronic physical health condition.

Methods—Participants (N = 435) from the National Study of Daily Experiences completed a series of daily diary interviews between 1995 and 1996 and again 10 years later.

Results—Greater affective (i.e., emotional) reactivity to daily stressors at Time 1 was associated with an increased risk of reporting a chronic physical health condition at Time 2.

Conclusion—Results indicate that how people respond to the daily stressors in their lives is predictive of future chronic health conditions.

The Centers of Disease Control and Prevention has named chronic disease the "public health challenge of the 21st century (1)," an initiative befitting a problem projected to affect nearly half of the U.S. population by the year 2030 (2). The costs associated with chronic health conditions are widespread: They are associated with reduced quality of life (3), decreased affective well-being (4), and elevated levels of depression (5), which is the leading cause of disability in the United States (6). Compared to their healthier counterparts, people with chronic conditions are more likely to be unemployed, to report financial difficulties (7), and to suffer from daily activity limitations (8). Chronic health conditions account for three of every four dollars spent on healthcare (9) and are responsible for 96% of Medicare spending (10). Given the psychological, physical and economic ramifications of chronic conditions, identifying factors that contribute to their etiology is an important area of inquiry.

One factor that has been of increasing interest to both the scientific community and to the general public is whether psychological stressors are adversely associated with physical health and are predictive of future health problems. Research on this topic has primarily focused on the long-term health effects of chronic stressors and traumatic life events, such as war combat (11), child abuse (12) and bereavement (13). Few studies have examined if daily stressors—that is, the minor hassles of life—have long-term physical health consequences.

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Conflict of Interest Statement: The authors have no conflict of interest to disclose.

Daily versus chronic stressors

Daily stressors refer to the challenges of day-to-day living, and encompass both predictable challenges, such as caring for a child or commuting between work and home, as well as unexpected events, such as a malfunctioning home appliance, an unexpected work deadline, or a traffic jam. Daily stressors are minor, yet they occur frequently—on 40% of all days (14). Daily stressors differ from chronic stressors in important ways. A key feature of chronic stressors is their open-ended nature. Chronic stressors, such as living in poverty or being underemployed, remain constant from day-to-day, whereas daily stressors are more short-lived (15). Furthermore, daily stressors have been shown to occur independently of chronic stressors (16).

A substantial body of work indicates that chronic stressors are associated with increased morbidity and mortality (11,17). For example, low socioeconomic status is related to declines in health status and elevated mortality rates (18). Similarly, low levels of social support are associated with elevated risk of cardiovascular disease, and increased mortality (19). Yet, it is unclear if daily stressors have similar long-term physical health ramifications.

Are daily stressors harmful to well-being?

Daily stressors are less severe than chronic stressors, but they are nonetheless associated with adverse same-day physical health outcomes. Compared to stressor-free days, days on which stressors are experienced are associated with increased physical health symptoms and an exacerbation of current physical health conditions (20). On days people encounter stressors, they report lower levels of overall subjective health (21) and more physical health complaints, such as fatigue (22), sore throat, headache, or backache (23,24,25). Daily stressors also appear to exacerbate illness-related symptoms among people with existing chronic health conditions (26,27). For example, daily hassles are associated with increased pain sensitivity among people with chronic tension headaches (28), elevated joint pain among people with rheumatoid arthritis (29), and increased disease severity among people with psoriasis (30). People with sickle cell disease also report greater same-day pain, increased health care usage, and greater work absences on stressor days compared to stressor-free days (27).

Daily stressors also appear to elicit changes in biomarkers of the cardiovascular, immune and neuroendocrine systems (15). For example, daily stressors are associated with increased daily cortisol (31) and daily worry is associated with low heart rate variability during hours of both waking and sleep (32). Similarly, work stressors are associated with increased catecholamine levels, decreased heart rate variability, and elevated levels of prolactin (33). Likewise, perceived daily discrimination is associated with elevated blood pressure across the day, as well as a higher nocturnal heart rate (34). Among caregivers, multiple daily stressors are also associated with elevated levels of C-reactive protein and proinflammatory cytokines (35).

Theorists posit that ongoing physiological changes such as these lead to biological wear-and-tear, which, in turn, may increase one's susceptibility to illness later in life (36), and some longitudinal studies support this hypothesis. For example, in one study participants had their blood pressure monitored during a normal workday. Twenty years later, participants were re-contacted and their risk of hypertension assessed. Results revealed that higher systolic blood pressure during a normal workday at Time 1 was associated with greater odds of reporting hypertension at Time 2 (37). Another study examined the association between negative social interactions and metabolic syndrome, and revealed that participants who reported more intense negative social interactions were at greater risk of metabolic syndrome two years after initial assessment (38). Similarly, a meta-analysis

indicated that people who showed strong reactivity and poor recovery from a mental laboratory stress test had a greater likelihood of showing poor cardiovascular outcomes over time (39). Finally, in a study examining the consequences of chronic and routine racial discrimination, Gee and colleagues found that Asian-Americans who perceived greater racial discrimination had an increased likelihood of reporting a chronic condition one year after initial assessment (40).

Stressor exposure versus stressor reactivity

Together, these studies suggest that heightened affective reactivity to daily stressors elicits a physiological response, which may, over time, tax the body and increase the likelihood that a person will experience a chronic health condition. Not all stressors, however, elicit a physiological response. According to Folkman and Lazarus' Transactional Model of Stress (41), the stressfulness of a situation is informed by two appraisal processes. During primary appraisal, a situation or a stimulus is assessed for the potential harm or threat it may cause. If the stimulus is viewed as benign, the stress response is averted. If, however, the stimulus is viewed as threatening, secondary appraisal processes are employed, during which an individual assesses his or her resources to determine if it is possible to overcome the stressor. The stress response is activated only when a person decides that an event is harmful and he or she lacks the resources to cope with it (42).

Stressor exposure and stressor reactivity can therefore be conceptualized as two very different constructs. Whereas stressor exposure refers to whether a person encounters a stressor, stressor reactivity refers to an individual's reaction to that stressor. In other words, some people may take stressors in stride, showing only small changes in the emotions they experience on days they encounter stressors compared to stressor-free days. Others, however, may react very strongly and negatively when they encounter stressors, showing a high degree of change in the emotions they experience on a non-stressor day compared to a stressor day. These differential reactions may, in turn, may have implications for well-being, particularly if—as research attests—there is some degree of trait-like stability in how an individual reacts to the stressors he or she encounters (43).

The current study

The current study examines whether heightened affective reactivity to daily stressors is associated with long-term risk of reporting a chronic physical health condition. We examine this question in a sample of 435 adults who--in the mid-1990's and again ten years later--reported the daily stressors they experienced, their reactivity to these stressors, and their physical health status. We hypothesize that people who report greater affective reactivity to daily stressors at Time 1 (T1) are more likely to report a chronic physical health condition at Time 2 (T2).

Stressor reactivity or trait negative affect?

One question that may arise from the current investigation is whether participants' propensity to experience negative affect (NA) is responsible for any association between how they react to daily stressors and how likely they are to report a chronic physical health condition. In other words, are some people more likely to report *both* psychological and physical health problems simply because they are prone to negative emotionality? Indeed, previous research indicates that high levels of trait negative affect are associated with subjective health complaints, such as physical health symptoms and general malaise (44). People who score high on neuroticism—a trait-like measure of emotional instability—are also more likely to experience somatic complaints (45) and to report chronic health conditions later in life (46). Although research indicates that people are generally accurate at reporting the chronic conditions they experience (47, 48), we wanted to ensure that the

results of the current investigation are not due to trait negative affect. For this reason, we include as covariates each person's average level of negative affect on non-stressor days, as well as his/her overall neuroticism score.

Method

Participants and Procedure

Participants included a subset of individuals who completed the Midlife Development in the United States (MIDUS) survey between 1995 and 1996 (N = 4242; ages: 24-74). The MIDUS consisted of a telephone interview and a series of self-administered questionnaires designed to assess participants' physical, emotional, and mental well-being, with the goal being to better describe the psychological and physiological states that characterize midlife. Participants were recruited using a random digit dialing protocol of telephone numbers available in the contiguous United States for the purpose of acquiring a diverse, national sample. For more information on the larger MIDUS study and details regarding recruitment procedures, see Brimm, Ryff and Kessler (49) and Radler and Ryff (50). Description of the entire protocol is outside the scope of the current manuscript; however, detailed information on all measures, as well as the data collected can be obtained from the MIDUS website: http://midus.wisc.edu/index.php.

A randomly chosen subset of MIDUS participants also completed the National Study of Daily Experiences (NSDE; 51,52). This repeated interview protocol focused on assessing participants' daily experiences in a format that reduces reliance on long-term retrospective recall, a problem that may bias reports of daily events (53). Of the 1,483 randomly selected participants, 1,031 agreed to participate (men: 469; women: 562). NSDE participants were contacted on each of eight consecutive days and asked about their daily experiences during the previous 24 hours, including the emotions they felt, the activities they engaged in, and the stressors they experienced. Ten years later, participants were re-contacted for a second MIDUS survey (MIDUS II) and set of daily interviews (NSDE II). Of the 1,031 original NSDE participants, 77% agreed to participate in the second wave of data collection (N = 793; men: 350; women: 443). Participants at T2 were between 34 and 84 years of age (N = 55.82; SD = 12.46), were primarily European-American (92.6%), and were fairly well-educated, with just over 50% having completed some college.

Measures

Chronic conditions—At each wave of MIDUS data collection, participants were provided with a list of chronic health conditions and asked to indicate those they had experienced or had been treated for during the previous year. They also reported whether they had *ever* experienced cancer (either yes or no) or heart disease (defined as heart trouble suspected or confirmed by a doctor), as these conditions typically require ongoing care. To prevent the same or similar conditions from being counted multiple times, chronic conditions were reduced from 29 individual conditions to 16 chronic condition categories. Conditions directly related to emotional distress (e.g., anxiety/depression) were excluded. Table 1 provides a listing of all chronic condition categories, the conditions they comprise, and the percentage of respondents reporting these conditions at Time 1 and at Time 2.

Covariates—To ensure that the findings of the current study cannot be attributed to known confounding variables, we included as covariates those variables that have previously been associated with the likelihood of reporting a chronic physical health condition. All covariates were assessed during MIDUS II.

Education was assessed via an ordinal scale representing less than a high school degree (1), a high school diploma or a General Equivalency Diploma (2), some college, but no degree (3), a four-year degree (4), and at least some graduate school (5).

Race: Due to the small number of ethnic minorities, race was assessed with a dichotomous variable representing white (0) or other (1).

Neuroticism is a trait-level measure of emotional instability associated with an increased likelihood of reporting a physical health condition (46). Adjectives on the current scale were selected from existing trait inventories (54,55,56). Items were obtained by selecting those with the highest item-total correlations in a pilot study of 1,000 participants prior to its use in the MIDUS telephone survey. Participants rated adjectives on a four-point scale, anchored at 1 (not at all) and 4 (a lot), the extent to which each of the following described them: moody, nervous, worrying and calm (reverse-scored). Scores across these adjectives were then averaged ($\alpha = .69$). For full psychometric properties of this scale, see Lachman and Weaver (57).

History of smoking was calculated by having participants indicate whether they "ever smoked cigarettes regularly." Approximately half of the sample indicated that they had at one time regularly smoked cigarettes.

Current mental/emotional health: Current mental health status was assessed in MIDUS II by asking participants the following question "Would you say your mental or emotional health is excellent, very good, good, fair, or poor?" Scores were reverse-coded such that higher scores indicate better mental/emotional health.

Body mass index: Participants' weight and height were assessed, from which body mass index was calculated. Participant's weight was first converted into kilograms and their height was converted into meters squared. Their weight was then divided by their height.

Daily Stressors and Affective Reactivity—*Daily stressors* were assessed during each nightly interview using the Daily Inventory of Stressful Events (58). The Daily Inventory of Stressful Life Events comprises a series of stem questions asking whether participants encountered each of six types of daily stressors during the previous 24 hours: conflict, avoided conflict, discrimination, stressors at work or school, stressors at home, and network stressors (a stressful event that happened to someone in the participant's social network that affected the participant). Participants also indicated whether they had experienced anything else that most people would consider stressful. Affirmative responses were followed by questions designed to obtain details about each stressor, such as the risk it posed to the participant and whether other people were involved. All open-ended information was recorded, transcribed and coded for several characteristics. This method provided a way to distinguish between a stressful event (e.g., an argument with a friend) and the affective response to the stressful event (e.g., feeling angry). It also provided a way to identify whether a stressor was reported more than once. Approximately 5% of reported stressors were discarded because they were either solely affective responses or they were identical to stressors that were previously mentioned on that day.

Daily psychological distress was assessed using the Non-Specific Psychological Distress Scale (59). During each nightly interview, participants rated on a four-point scale, anchored at 1 (none of the time) and 4 (all of the time), how often they experienced the following emotions or emotion descriptors during the previous 24 hours: hopeless; nervous; worthless; restless or fidgety; that everything was an effort; and so sad that nothing could cheer them up. Cronbach's alpha for each day ranged from .63 to .74 at T1 and .66 to .75 at T2.

Affective reactivity refers to the difference in an individual's level of negative affect (NA) on stressor versus non-stressor days (14). This difference was calculated using multi-level models in SAS PROC MIXED, where Level 1 represents within-person variability and Level 2 represents between-person variability (60). For the current analyses, we calculated T1 within-person slopes indexing the change in negative affect from days without a reported stressor to days with a reported stressor for each individual. Due to the high level of skewness in this variable, data were winsorized at the 90th percentile. Winsorizing is a strategy whereby values of a variable are set to a given percentile, which allows researchers to retain information from all participants--in their respective order--but reduces the effect of spurious outliers. In this way, participants who are at the highest level of a variable remain at the highest level, though not to the point of skewing the data, which makes it possible to address extreme values without having to discard data or alter its structure (61).

Daily NA on non-stressor days: Participants' average level of NA on non-stressor days was calculated and included as a covariate in all analyses, making it possible to distinguish between effects driven by how people react to daily stressors (calculated by affective reactivity slopes) and effects driven by the daily NA they typically experience. It was calculated by taking the mean NA on non-stressor days for each participant (mean = .09, range = 0 – 1.5). Data were again winsorized due to skewness.

Results

Of the 793 participants who completed both waves of data, 82 did not encounter a daily stressor at Time 1, so affective reactivity slopes could not be calculated. In addition, NA scores on non-stressor days were missing for 32 participants. Of the remaining 679 participants, 3 were missing information on education status, 78 were missing body mass index data, 8 were missing information on neuroticism, and 155 were missing information on smoking status. In total, 435 participants had complete information. We conducted our analyses on both the group of 679 participants who were missing data on one or more of these covariates and on the 435 participants with complete information. Because the pattern of results did not differ between these two groups, analyses testing our main hypotheses were conducted on the sample with the most complete data ($n = 435$). Participants with complete data did not differ from participants who were missing data in terms of age, $t(791) = -.75$, *n.s.*, education, $\chi^2(1, N = 790) = 6.56$, *n.s.*, or gender, $\chi^2(1, N = 793) = 1.01$, *n.s.*

Chronic health conditions and daily stressors at T1 and T2

There were a number of changes between T1 and T2 with regard to the chronic conditions people reported. For example, 62% of conditions reported at T2 were not present at T1 ($n = 269$). The number of people reporting multiple comorbidities increased over time ($\chi^2(1, N = 435) = 177.21$, $p<.001$, T1 ($n = 353$), T2 ($n = 411$)), as did the number of people reporting more serious chronic conditions, such as cancer $\chi^2(1, N = 433) = 195.7$, $p<.001$, cardiovascular disease $\chi^2(1, N = 435) = 118.41$, $p<.001$, and diabetes ($\chi^2(1, N = 435) = 77.7$, $p<.001$). People reporting chronic conditions tended to be older both at T1, $r(435) = .23$, $p<.001$ and at T2, $r(435) = .27$, $p<.001$.

The number of stressors people reported decreased over time. At T1, respondents reported experiencing at least one stressor on 41% of days; at T2, this percentage decreased to 35%. Similarly, the occurrence of multiple stressors decreased over time, from 12% of study days at T1 to 8% of study days at T2.

Risk of any chronic condition at T2

Our primary interest was whether affective reactivity to daily stressors at T1 increased an individual's risk of reporting a chronic condition at T2. We therefore categorized participants who reported one or more chronic condition(s) as "having" a chronic condition, and categorized participants who reported experiencing no chronic conditions as "not having" a chronic condition. We categorized chronic conditions in this way at both T1 and at T2. Our dependent variable was whether a person did (1) or did not (0) report a chronic condition at T2. Our independent variables included affective reactivity slopes at T1, chronic conditions (coded 1 = yes; 0 = no) reported at T1, average number of daily stressors encountered at T1, and each person's average level of daily NA on non-stressor days at T1. We also included several covariates that have previously been associated with an increased risk of reporting a chronic condition: age, gender, race, highest level of education completed, neuroticism, history of smoking, body mass index, and a current rating of mental/emotional health. Continuous covariates were grand-mean centered and the model was estimated from unstructured covariance matrices, as we did not want to make assumptions regarding the magnitude of correlation between our observations. Table 2 presents bivariate correlations among all variables in the model. Although many of these variables were significantly correlated, multicollinearity was not a problem, and all covariates were therefore included in our analyses.

To determine the relative risk of reporting a chronic condition at T2, we conducted a Poisson regression with robust error variance, which makes it possible to obtain adjusted relative risk (aRR) estimates without under or over-estimating effect sizes (62). The aRR is interpreted as the change in the occurrence of an event for a one-unit increase in some predictor variable. For the current study, the aRR represents how a one unit increase in affective reactivity changes one's risk of reporting a chronic condition at T2. aRR estimates were obtained using the ESTIMATE command in SAS.

Analysis with the entire sample

For our main analysis predicting risk of reporting a chronic condition at T2, all independent variables and covariates were added simultaneously. As shown in Table 3, results of this model indicated that greater affective reactivity to daily stressors at T1 was associated with an increased risk of reporting a chronic health condition at T2. Specifically, for every one unit increase in affective reactivity, there was a 10% increase in the risk of reporting a chronic health condition 10 years later. However, no significant associations emerged for stressor exposure. This model also indicated that older participants, those with higher body mass index, those who scored lower on the mental/emotional health scale, and those who reported a chronic condition at T1, were more likely to report a chronic condition at T2.

Reduced, healthy sample

Next, we examined whether these associations remained when only examining people who reported no chronic conditions at T1. We conducted the same analysis as above, but limited it to the 105 participants who reported no chronic conditions at T1. Affective reactivity was once again associated with a greater risk of reporting a chronic condition at T2. In this sample, every one unit increase in affective reactivity was associated with a 40% increase in the risk of reporting a chronic condition at T2. Once again, participants who reported a chronic health condition at T2 were more likely to be older and to have reported lower levels of mental/emotional health at T2 (Table 3, Model 2).

Risk of specific chronic condition clusters

Our next set of analyses explored how specific T2 illness clusters contributed to the significant findings. We conducted separate analyses for each chronic condition type. In each model, the dependent variable was whether participants reported a specific type of illness at T2, coded as 0 (no condition) or 1 (condition). Independent variables were the same as described in the overall model, with one exception: instead of including *any* chronic condition at T1, we included the specific illness we were predicting. For example, if we were predicting risk of diabetes at T2, we included diabetes at T1 as a covariate. Due to the relatively small number of certain types of chronic conditions (i.e., gall bladder trouble, autoimmune disorders, cancer, and neurological disease), we were unable to run analyses on all conditions. Of the 12 chronic condition categories remaining, affective reactivity at T1 significantly predicted the risk of reporting digestive conditions at T2. There was also a trend for T1 affective reactivity to predict T2 pain-related conditions ($p = .064$) and urinary/bladder conditions ($p = .073$). All other analyses resulted in p values ranging from .15 to .89. To ensure that our findings were not driven solely by digestive conditions, we conducted an additional analysis, combining all conditions *except* digestive disorders. The overall model testing the association between affective reactivity at T1 and risk of any chronic condition at T2 was still significant (Estimate = .1, $p < .05$), indicating that the association is not solely due to digestive conditions.

Discussion

Daily stressors: The missing link

Research examining the association between stress and health has evolved considerably since the publication of Hans Selye's *The Stress of Life* (1956) (64). Once resigned to checklists assessing previously experienced major life events or traumatic experiences (65), assessment of stressor exposure and reactivity can now be examined on a daily—or even momentary—basis (14). The current study utilized these methodological and statistical advancements to examine a hypothesis that theorists have purported for years: that responding to the ebbs and flows of daily life may have long-term physical health consequences (20). Results reveal that heightened affective reactivity to daily stressors is associated with long-term risk of reporting a chronic physical health condition. Daily stressor exposure, in and of itself, however, is not associated with an increased risk of long-term physical health problems, indicating that the adverse effects of stress on health may have less to do with being exposed to stressors and more to do with how one reacts to these stressors. Indeed, for every one unit increase in stressor reactivity at T1, risk of reporting a chronic health condition at T2 increased by 10%.

Affective reactivity or negative response bias?

The current study revealed that stressor reactivity was predictive of chronic health conditions ten years later, but issues may arise because both our independent and dependent variables were ascertained through self-report. Researchers have warned that utilizing self-report data for both predictor and outcome variables may lead to a spurious, inflated association between the two variables, due to a negative response bias (64). In other words, people who react strongly to daily stressors may simply be more likely to report physical health problems than their less reactive peers. This is a valid concern and one which psychologists and physicians must be mindful. Yet, we believe that self-report data has merit and that this concern does not diminish the importance of our findings. Indeed, there are several reasons for examining people's self-reported physical health status. First, several studies indicate that there is substantial overlap between self-reported chronic health conditions and physician-based diagnoses (47, 48), which suggests that self-reports can be a valid—if not ideal—way to ascertain information regarding health status. Second, self-

reported physical health symptoms are typically the reason why people visit their physicians. Therefore, whether a physical complaint is actually part of a disease process or is simply discomforting to the patient, the cost to the individual's quality of life and to the health care system as a whole is the same (66,67,68,69,70). Moreover, although we cannot say for certain whether a condition represents a physician-diagnosed disease, we did identify a novel predictor of self-reported health problems years prior to their occurrence, which could inform public health interventions.

In addition, although it is impossible to completely account for negative response bias, we were conservative in our analyses, controlling for a host of factors associated with increased negative affectivity, including negative affect on a non-stressor day, neuroticism, and mental/emotional health. Even when including these covariates in our analyses, affective reactivity to daily stressors at T1 was still predictive of chronic health conditions at T2. This indicates that our findings are not simply the result of people's propensity to experience NA.

Exploration of specific conditions

Our main analyses examined the association between affective reactivity at T1 and risk of reporting *any* chronic condition at T2. However, additional analyses examining individual condition clusters revealed that T1 affective reactivity significantly predicted an individual's risk of reporting a digestive condition, with a trend toward pain-related and urinary/bladder conditions. One question that may emerge from these individual analyses is why these three illness clusters in particular? One possible reason is that the link between affective processes and biological pathways may be stronger for some chronic conditions compared to others (66). For example, in one study neuroticism was associated with ulcers and arthritis, but not with stroke or hypertension (67). In another, neuroticism was linked to the occurrence of 14 different diseases 25 years later, but the strongest links were found between neuroticism and pain and neuroticism and digestive disorders marked by chronic and diffuse pain (68).

This is the first investigation to link naturalistic, daily stressor reactivity to physical health conditions, but it is not the first to show links between stressors and these three specific chronic condition clusters. For example, previous research has revealed that child abuse survivors have an increased tendency to report digestive disorders (69,70). Survivors of trauma are also more likely to report chronic pain conditions (71, 72) and symptoms of genitourinary dysfunction, such as stress and urge incontinence (73). Moreover, stress is associated with the onset or exacerbation of both gastrointestinal conditions (74) and chronic pain conditions (75). Stress also activates bladder mast cells, which have been implicated in the development of intersistial cystitis (76). These disorders are not life-threatening; however, they are associated with decreased quality of life (77), significant work day loss (78,79), and excessive health-care costs (80). For example, compared to patients without chronic pain, chronic pain patients are five times more likely to use health care services (81), and chronic pain conditions are responsible for 21.5% of "out of role" days (78).

Future directions and limitations

The focus of the current study is on the health implications of daily stressors, but future research should examine how chronic and daily stressors work synergistically to influence physical health. A large body of work has linked chronic stressors and traumatic experiences to physical health problems (11,82). The current study is among the first to reveal a similar association between affective reactivity to daily stressors and risk of reporting a chronic health condition over time. Research would benefit from combining these two approaches—that is, examining how chronic life stressors in conjunction with daily hassles relate to both short- and long-term physical health outcomes. Studies examining these links have found some intriguing results. For example, one study compared the physical symptoms sexual

abuse survivors experienced on stressor versus non-stressor days to the symptoms reported by non-abused women (83). Whereas women with no history of abuse showed no difference in the physical symptoms they reported on stressor versus non-stressor days, sexual abuse survivors reported more physical symptoms on stressor days compared to non-stressor days. Future studies should continue to examine this important line of research.

In the current study our association was based on daily diary data collected at two points in time. Although eight daily diary days provides us with adequate intra-individual variability, multiple measurement bursts (i.e., a series of daily diary interviews collected over time) may be more informative in elucidating the mechanisms through which stress processes affect physical health. For example, it may be the case that people who normally have heightened reactions to stressors simply did not encounter a stressor during the eight days they were interviewed in the current study. Additional measurement bursts could provide this important information. Also, affective reactivity was conceptualized based on the assumption that the occurrence of a daily stressor increased reported negative affect. Experiencing higher levels of negative affect, however, may make people more likely to perceive their situations as stressful (and thereby report a stressor), or to engage in activities that would create stressors. Unfortunately, these data do not allow us to tease apart these possibilities.

Conclusion

Daily stressors are less severe than major life events and do not carry the long-term threat of chronic stressors. Yet, the current investigation reveals that how people react to the daily stressors in their lives has long-term implications for physical health. By identifying individuals at-risk for physical health problems years before their occurrence, it is possible to design public health interventions aimed at helping people modify the precipitating behavior. Interventions aimed at decreasing reactivity to daily stressors could, therefore, reduce the likelihood that an individual will report experiencing a chronic health condition in the future. Given the individual and societal costs for chronic health problems, this is an important endeavor for researchers and clinicians alike.

Acknowledgments

This work was supported by National Institute of Health Grants awarded to David M. Almeida (P01 AG020166 and R01 AG019239) and Martin J. Slwinski (P01 AG03949).

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Table 1

Percentage of People Reporting Chronic Health Conditions at Time 1 and Time 2 (N = 435)

Type of Chronic Condition	Time 1 % of sample	Time 2 % of sample
Autoimmune Disorders	.9%	.9%
Cancer	7.6%	10.6%
*Cardiovascular Conditions	24.1%	41.2%
Diabetes or High Blood Sugar	3.0%	10.6%
*Digestive Conditions	21.2%	24.4%
Foot Trouble	10.4%	10.6%
Hay Fever	15.7%	12.2%
Gall Bladder Trouble	4.1%	2.3%
*Lung Conditions	13.2%	13.1%
Neurological Conditions	1.6%	3.2%
*Pain-Related Conditions	33.6%	38.6%
Skin Trouble	9.9%	10.8%
Thyroid Disease	4.6%	8.3%
*Trouble with Gums, Mouth or Teeth	11.8%	7.4%
Urinary or Bladder Problems	10.0%	12.2%

*Combined categories

Cardiovascular conditions = heart disease; stroke; high blood pressure or hypertension

Digestive Conditions = recurring stomach trouble, indigestion, or diarrhea; constipated all/most of time; ulcer

Lung conditions = asthma, bronchitis, emphysema; tuberculosis, other lung problems

Pain-related conditions = arthritis, rheumatism or other bone/joint diseases; sciatica, lumbago or recurring backache; migraine headaches

Trouble with gums, mouth or teeth = persistent trouble with gums or mouth; persistent trouble with teeth

Table 2

Correlation matrix for all variables in the model.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1. T2 Chronic Condition	-												
2. T1 Affect Reactivity	.08	-											
3. T1 Stressor Exposure	-.03	**.34**	-										
4. Non-stress daily NA	.08	**.53**	**.16**	-									
5. T1 Chronic Condition	.47	*.11*	.03	.06	-								
6. Gender (1 = Female)	.08	*.10*	*.10*	**.13**	.06	-							
7. Age	**.28**	**-.14**	**-.24**	*-.10*	**.18**	-.05	-						
8. Race (1 = White)	.09	-.04	-.01	-.03	-.01	-.14	.05	-					
9. Education	-.00	-.06	.21	-.04	-.06	-.09	-.08	.05	-				
10. Neuroticism	-.00	**.29**	*.10*	**.25**	.01	*.11*	**-.23**	.01	-.13	-			
11. Smoking (1 = Yes)	.00	.05	-.06	.07	.16	-.08	.06	.11	**-.18**	.01	-		
12. Emotional Health	**-.14**	**-.28**	-.06	**-.22**	-.09	-.07	.01	.02	.18	**-.34**	-.07	-	
13. Body Mass Index	**.16**	.05	-.02	.00	.04	-.09	-.01	-.05	-.10	-.02	.04	-.06	-

underline = <.05; *italics* = <.01; **boldface** = <.001; NA = Negative Affect

Table 3

Factors associated with the likelihood of reporting a chronic condition at T2 among the entire sample (Model 1) and participants who reported no chronic conditions at T1 (Model 2).

Risk factors	Model 1 Estimate (SE) (*N* = 435)	Model 2 Estimate (SE) (*n* = 105)
Intercept	-.192 (.037)***	-.576 (.145)***
T1 Affective Reactivity	.096 (.044)*	.337 (.167)*
T1 Stressor Exposure	-.034 (.075)	-.222 (.227)
Non-stress daily NA	.111 (.106)	.285 (.525)
T1 Chronic Condition (ref = No)	.298 (.080)***	
Gender (ref = Female)	-.044 (.046)	.065 (.172)
Age	.011 (.002)***	.022 (.007)***
Race (ref = White)	-.018 (.107)	.304 (.223)
Education	.032 (.021)	-.022 (.074)
Neuroticism	-.004 (.043)	-.020 (.142)
History of Smoking (ref = Yes)	.064 (.047)	.116 (.163)
Mental/Emotional Health	-.082 (.027)**	-.234 (.094)*
Body Mass Index	.015 (.004)***	.010 (.013)

* $p < .05$;

** $p < .01$;

*** $p < .001$;

NA = Negative Affect