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Within-person associations of optimistic and pessimistic expectations with momentary stress, affect, and ambulatory blood pressure

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Abstract

Although dispositional optimism and pessimism have been prospectively associated with health outcomes, little is known about how these associations manifest in everyday life. This study examined how short-term optimistic and pessimistic expectations were associated with psychological and physiological stress processes. A diverse sample of adults (*N*=300) completed a 2-day/1-night ecological momentary assessment and ambulatory blood pressure (ABP) protocol at ~45-minute intervals. Moments that were more optimistic than typical for a person were followed by moments with lower likelihood of reporting a stressor, higher positive affect (PA), lower negative affect (NA), and less subjective stress (SS). Moments that were more pessimistic than typical were not associated with any affective stress outcome at the following moment. Neither optimism nor pessimism were associated with ABP, and did not moderate associations between reporting a stressor and outcomes. These findings suggest that intraindividual fluctuations in optimistic and pessimistic expectations are associated with stressor appraisals.

Keywords

Optimism; Pessimism; Stress; Affect; Ambulatory Blood Pressure; Ecological Momentary Assessment

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Dispositional optimism and pessimism are cognitively-based psychological personality traits characterized by generalized expectations toward positive and negative outcomes, respectively. Generally, higher levels of dispositional optimism have been found to be protective and higher levels of pessimism have been found to be detrimental towards the

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progression of psychological and physical health ailments. This has been in observed in conditions including depression, cardiovascular disease and all-cause mortality (Boehm et al., 2018; Boehm & Kubzansky, 2012; Chang, 2002; Craig et al., 2021; Kim et al., 2017; Rasmussen et al., 2009; Roy et al., 2010; Scheier & Carver, 2018). One explanation for how dispositional optimism and pessimism can affect psychological and physical health is through their impact on stress processes. Specifically, people who exhibit higher dispositional optimism tend to engage in more frequent health-promoting behaviors and benefit from the adaptive physiologic corollaries of effective coping than people higher in dispositional pessimism (Friedman et al., 1992; Jones et al., 2017; La Marca et al., 2017; Puig-Perez et al., 2017; Scheier & Carver, 2018; Terrill et al., 2010). Despite relatively robust evidence linking dispositional optimism and pessimism to longer-term health outcomes, less is known about how such associations may emerge. One general view is that the transactional processes of everyday life, including stress response processes, are influenced by dispositional optimism and pessimism. That is, the cumulative effects of dispositional optimism and pessimism on how stressors are experienced (and subsequently reported over time) are a potential pathway by which broader, longer-term health benefits may be observed.

Despite the classical view of personality traits being relatively stable, there is growing evidence that – even in the presence of reliable individual differences – there is intraindividual variation in the levels of such traits (including dispositional optimism and pessimism). Dispositional optimism and pessimism have typically been characterized as relatively stable traits that do not fluctuate much over time. Evidence for this stability has been observed in several studies finding strong test-retest reliability, with correlations ranging between 0.35 and 0.79, with measurements up to 10 years apart (Atienza et al., 2004; Matthews et al., 2004; Scheier et al., 1994; Scheier & Carver, 1985, 2018; Suzanne C & Segerstrom, 2007). This view has resulted in a large body of informative work investigating average differences between people who exhibit high or low dispositional optimism and pessimism. Yet, despite the evidence of rank-order stability over time, people may be more or less optimistic or pessimistic than typical in any given moment. Segerstrom (Segerstrom, 2019) noted that such fluctuations in many trait-like measures (including dispositional optimism and pessimism) can be meaningful and may be relevant to health and well-being. For instance, in a year-long longitudinal study, increases in dispositional optimism correlated with improvements in cellular immunity (Segerstrom & Sephton, 2010). Such evidence supports the idea that people are not always at their "typical", or "trait" level of dispositional optimism and pessimism, and these deviations may meaningfully correspond with certain health indicators and/or outcomes. Currently, however, it is unclear how these processes may unfold at shorter time scales; namely throughout the course of a day. Understanding momentary fluctuations in short-term optimistic and pessimistic expectations in everyday life may shed insight into their associations with stress processes and physical health.

Measuring short-term optimistic and pessimistic expectations in daily life requires ambulatory assessment methods such as ecological momentary assessment (EMA). EMA is a repeated measures method where participants complete questionnaires about their contexts, experiences, and behaviors in their natural environments, and is often paired with ambulatory assessments of physiological processes via wearable devices (Smyth et al., 2017). Accordingly, EMA is a useful method to repeatedly sample, within persons, moments of optimistic and pessimistic expectations and corresponding affective and physiologic processes in daily life. As EMA methods repeatedly sample experiences throughout the day, it is possible to capture within-person variability in optimistic and pessimistic expectations and examine their associations with other momentary affective and physiologic stress processes.

The purpose of this paper was to use EMA and ambulatory assessments of blood pressure to evaluate how momentary levels of optimistic and pessimistic expectations were associated with stress processes in everyday life. We addressed three research questions:

1. *Do short-term optimistic and pessimistic expectations vary at the within-person level?* We evaluated intraclass correlations to determine to what extent people deviate from their typical levels optimistic and pessimistic expectations across moments in their everyday lives.

2. *How are levels of short-term optimistic and pessimistic expectations at one assessment associated with stress, affect, and ambulatory blood pressure at the next assessment?* We tested whether moments characterized by higher than typical (for a given person) levels of optimistic and pessimistic expectations were associated with the odds of reporting a stressor, perceptions of stress, negative affect (NA), positive affect (PA), and ambulatory blood pressure (ABP) measured at the next moment.

3. *Do levels of short-term optimistic and pessimistic expectations at one assessment moderate stress reactivity at the next assessment?* We tested whether moments characterized by higher than typical (for a given person) levels of optimistic and pessimistic expectations moderated the contemporaneous associations between reporting a stressor and perceptions of stress, NA, PA, and ABP at the next moment.

Methods

Participants

Data come from wave 1 of the North Texas Heart Study (NTHS; (Ruiz et al., 2017), which included a community sample of 300 healthy adults (50% women), ages 21-70 years (M = 42 years, SD = 12.76 years). Participants were ineligible for the study if they had previous history of myocardial infarction or tertiary cardiac interventions, a pregnancy within the past year or anticipated pregnancy during the study period, cognitive impairment, and/or an occupation that required shift work. Sampling at recruitment was stratified by age within gender and race/ethnicity. This sample included 60% non-Hispanic White, 15% non-Hispanic Black, and 19% Hispanic/Latinx, of which 75% self-identified as being of Mexican descent. A majority of the participants were married (60%), owned a home (63%), were employed outside the home (79%), and received at least some college education (86%). Substantial variability in income was observed in this sample with 12% reporting a household income less than $20,000, 10% above $150,000, and the modal annual

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household income reported to be between $75,000 and $150,000. Full participant sample characteristics are displayed in Table 1.

Measures

Short-term Optimistic Expectations.—Short-term optimistic expectations were evaluated at each EMA (~ every 45 minutes during waking hours each day) with a single item (i.e., *"I expect good things will happen to me before the next cuff inflation")* adapted from the 3-item optimism subscale of the Life Orientation Test- Revised (LOT-R; (Scheier et al., 1994)). The item was rated on a 7-point Likert-type scale (1 = Strongly Disagree to 7 = Strongly Agree). The average of these momentary assessments of optimistic expectations were positively correlated with the dispositional optimism subscale ($r = 0.39$) and negatively correlated with the dispositional pessimism subscale ($r = -0.33$) of the LOT-R (Felt et al., 2020), providing some evidence for convergent validity for this item.

Short-term Pessimistic Expectations.—Short-term pessimistic expectations were evaluated at each EMA (~ every 45 minutes during waking hours each day) with a single item (i.e., *"If something can go wrong for me before the next cuff inflation, it will")* adapted from the 3-item pessimism subscale of the LOT-R (LOT-R; (Scheier et al., 1994)). The item was rated on a 7-point Likert-type scale (1 = Strongly Disagree to 7 = Strongly Agree). The average of pessimistic expectations momentary assessments were positively correlated with the dispositional pessimism subscale ($r = 0.40$) and negatively correlated with the dispositional optimism subscale ($r = -0.31$) of the LOT-R (Felt et al., 2020), providing some evidence for convergent validity for this item.

Stressor Occurrence.—At each EMA, participants indicated whether they experienced a stressor since the previous cuff inflation via a single yes/no item (*"Since the previous cuff inflation, has anything stressful occurred?"*). The stressor occurrence variable was coded such that "1" indicated the presence of a stressor and "0" indicated the absence of a stressor. In this sample, a stressor was reported 1107 times (~15% of beeps), averaging 3-4 per participant.

Stress Perception.—Stress perceptions were evaluated at each EMA with a single item evaluating general perceptions of stress since the previous cuff inflation (*"In general, how stressed have you been since the previous cuff inflation?"*). Participants rated this item on a 7-point Likert-type scale (1 = Strongly Disagree to 7 = Strongly Agree), where higher scores reflected greater stress perceptions.

Affect.—Participants were asked to what degree they were currently feeling a series of negative and positive affect items at each EMA. For NA, participants were asked to what degree they currently felt sad, tense, angry, depressed, nervous, and hostile. For PA, participants were asked to what degree they currently felt happy, cheerful, lively, energetic, calm, and relaxed. Participants rated each emotion on a 7-point Likert-type scale (1 = Not at all to 7 = Extremely). NA and PA scores were calculated by averaging across the corresponding items, such that higher scores reflected higher levels of NA ($G_{Within} = 0.75$) or PA ($G_{Within} = 0.73$).

Ambulatory Blood Pressure.—Participants were fitted with an ABP cuff (Oscar II; Suntech, Inc.) and BP was collected before each EMA (~ every 45 minutes for 2 days/1 night). Prior to statistical analysis, we eliminated data with measurements outside the range of plausible blood pressure values in accordance to previous literature (Marler et al., 1988). Data meeting the following criteria were considered outliers and eliminated from the dataset: 1) systolic blood pressure values less than 70 and greater than 250 2) diastolic blood pressure values less than 45 and greater than 150 and 3) a systolic and diastolic blood pressure ratio greater than 3 or less than the following equation: 1.0625+0.00125 * diastolic blood pressure. In total, 164 (2%) data points were removed. BP measurements were then converted to mean arterial pressure (MAP), a weighted average of systolic and diastolic BP in accordance with previous literature (e.g., (Henry et al., 2002). All models examining BP as outcome used MAP for a reduction in model testing.[1]

Procedure

For brevity, only the elements most relevant to this study are described (see (Ruiz et al., 2017) for full protocol). Participants attended a laboratory session at a local vascular medicine clinic that also served as a general clinical research center. All laboratory sessions were conducted on Thursday mornings and followed by a 2-day/1-night ABP/EMA study. Prior to leaving the clinic site, all participants were fitted with an ABP cuff and provided a cellular phone for the EMA. The ABP assessments occurred roughly every 45-minutes and were following by an EMA during waking hours (8 AM to 10 PM). Data for these analyses were restricted to waking hours, and as a result, overnight ABP assessments were excluded. Informed consent was collected from all participants prior to the beginning of the study and the study was approved by the University of North Texas's Institutional Review Board.

Analytic Plan

All models were estimated in the mixed modeling framework via SAS v. 9.4 (SAS, 2011) using PROC MIXED for continuous outcomes and PROC GLIMMIX for binary outcomes. Because the level of each outcome may be influenced by previous assessments (i.e., autocorrelation), we controlled for the time lag (t-1) of the dependent variable in each model. We controlled for the time-lagged dependent variable rather than specifying an autoregressive residual structure so that we could adjust for the contemporaneous shared associations between optimistic and pessimistic expectations with each dependent variable at the previous moment. In models predicting MAP, we also controlled for the time-varying participants posture, activity level, and consumption of food, caffeine, alcohol, and cigarettes at time of the cuff inflation. No individual differences were controlled for because each person is compared to themselves, so these analyses are naturally adjusting for between person differences (Curran & Bauer, 2011). Results for all models were presented as unstandardized slopes (b) or odds ratios (OR) with corresponding 95% confidence intervals (CIs). Descriptive statistics were presented as cluster adjusted means (*M*) and standard errors (*SE*) estimated from empty models (i.e., intercept only), where the cluster accounts for somewhat unequal measurement occasions between participants. Standardized estimates were obtained by rerunning models with variables standardized using the within-person

[1]The pattern of results was similar for models with systolic and diastolic as the outcome.

standard deviation of within-person optimistic and pessimistic expectations ($SD_{w/pOptimism}$ = 0.709; $SD_{w/pPessimism}$ = 0.525).

Each predictor was centered on the mean for each person to capture within-person deviations around their typical levels. As momentary optimistic and pessimistic expectations capture participants' short-term expectations for the immediate future, they were used to predict outcomes at the following assessment. As such, we created lagged indicators (t-1) for optimistic and pessimistic expectations, which served as the primary predictors in each model. Optimistic and pessimistic expectations were included in each model together because there is evidence that they may differentially predict CVD relevant indicators (Felt et al., 2020; Rasmussen et al., 2009; Scheier & Carver, 2018; Serlachius et al., 2015).

For the first research question, empty models were estimated to obtain the intraclass correlations (ICC) for optimistic and pessimistic expectation. This value was then subtracted from 1 to obtain the percentage of within-person variation present. Additionally, within-person correlations between optimistic and pessimistic expectations were estimated using the rmcorr (Bakdash & Marusich, 2022) package in the R programming language (R Core Team, 2018). For the second research question, a series of 2-level multilevel models (repeated assessments nested within persons) was estimated where lagged person-centered optimistic and pessimistic expectations predicted stressor occurrence (yes/no), perceived stress, NA, PA, and MAP. Relative fit indices indicated that including correlated random intercepts and slopes fit the data better than models with only random intercepts in all models except when MAP was the outcome. Models with MAP as the outcome did not converge and the random effect for pessimistic expectations was zero. Removing the random effect of pessimistic expectations (i.e., only retaining the random effect for optimistic expectations) resulted in worse model fit than the model with only random intercepts. As such, models investigating within-person associations of optimistic and pessimistic expectations with NA, PA, and general perceptions of stress included random intercepts and slopes. The model investigating MAP included only random intercepts.

For the third research question, a series of 2-level multilevel models (repeated assessments nested within individuals) was estimated to test whether time-lagged optimistic and pessimistic expectations moderated the contemporaneous associations of stressor occurrence with stress perceptions, NA, PA, and MAP. First, we estimated the contemporaneous associations between stressor occurrence and each outcome. Next, we included optimistic and pessimistic expectations as interaction terms with stressor occurrence. Moderation analyses were restricted to moments that were not preceded by a stressor to reduce the impact of carryover effects and ensure moments where a stressor was and was not reported were more equivalent, providing a clearer estimate of stressor reactivity. Similar to the models fit for Research Question 2, relative fit indices indicated that including correlated random intercepts and slopes fit the data better in all models except when MAP was the outcome. The MAP models did not converge and relative fit indices were worse in models with random intercepts and random optimistic expectation slopes than in models with only random intercepts. As such, models with NA, PA, and general perceptions of stress as the outcome included random intercepts and slopes. The model with MAP as the outcome included only random intercepts.

Results

Descriptive Statistics

Participants responded to an average of 25.14 EMAs (*SD* = 7.44). The cluster-adjusted average for optimistic expectations was 4.89 (*SE* = 0.08) and 1.77 (*SE* = 0.06) for pessimistic expectations. On average, participants reported 3.69 stressors (ranging from 0-25) across the two days. Overall, participants had low levels of stress perceptions (*M* = 1.97, *SE* = 0.05, range 1 to 7) and NA (*M* = 1.44, *SE* = 0.03, range 1 to 7), and moderate levels of PA (*M* = 4.60, *se* = 0.05, range 1 to 7) suggesting participants were, on average, generally happy in daily life. Average MAP levels across the samples was 101.41 (*SE* = 0.83). ICCs from each outcome ranged from 0.38-0.63. Full descriptive statistics for each outcome are presented in Table 2.

Research Question 1 (Within-person variability)

Intraclass correlations for optimistic (*ICC* = 0.74) and pessimistic (*ICC* = 0.69) expectations reveal that 26-31% of the variation is at the within-person level. This indicates that although optimistic and pessimistic expectations are relatively stable, people vary from their typical levels from moment-to-moment. The average within-person correlation between optimistic and pessimistic expectations was weak but statistically significant ($r = -0.14$, $p < 0.001$), indicating that the levels of optimistic and pessimistic expectations in the moment were relatively independent. Because of the low within-person correlation optimistic and pessimistic expectations were included in the models together to address Research Questions 2 and 3. Model results are equivalent when estimating optimistic and pessimistic expectations in separate models.

Research Question 2 (Momentary Fluctuations and Stress Processes)

Moments characterized by higher than typical levels of optimistic expectations, for a given person, at one moment were associated with a 15% lower probability of reporting a stressor at the following moment (*OR* = 0.85, $CI_{95\%}$: [0.76, 0.96]). Additionally, moments characterized by higher than typical levels of optimistic expectations, for a given person, were associated with lower levels of stress perceptions ($b = -0.10$, $CI_{95\%}$: [−0.14, −0.06], $\beta = -0.07$), lower levels of NA ($b = -0.04$, $CI_{95\%}$: [−0.06, −0.01], $\beta = -0.03$), and higher levels of PA ($b = 0.07$, $CI_{95\%}$: [0.04, 0.10], $\beta = 0.05$) at the following assessment. Levels of optimistic expectations at one moment, however, were not statistically significantly associated with MAP at the following assessment ($b = -0.18$, $CI_{95\%}$: [−0.62, 0.25], β = 0.−0.05). Additional analyses revealed the person-means of optimistic and pessimistic expectations were not associated with daytime averages (see Felt et al., 2020) or with laboratory assessments of MAP (Optimistic: $b = 0.46$, $se = 0.68$, $p = 0.50$; Pessimistic: $b = -0.59$, $se = 0.84$, $p = 0.48$). Full results are displayed in Table 2.

Moments characterized by higher than typical levels of pessimistic expectations, for a given person, were not statistically significantly associated with the odds of reporting a stressor at the following assessment (*OR* = 1.03, $CI_{95\%}$: [0.87, 1.23]), stress perceptions ($b = 0.03$, $CI_{95\%}$: [−0.03, 0.10], $\beta = 0.02$) NA ($b = 0.01$, $CI_{95\%}$: −[0.02, 0.04], $\beta = 0.00$) or PA ($b = -0.01$, $CI_{95\%}$: −[0.05, 0.02], $\beta = -0.01$). Full results are displayed in Table 2.

Research Question 3 (Moderation)

As expected, the reporting of a stressor at one moment was concurrently associated with higher levels of perceptions of stress ($b = 1.52$, $CI_{95\%}$: [1.43, 1.61]), higher levels of NA ($b = 0.43$, $CI_{95\%}$: [0.39, 0.47]), lower levels of PA ($b = -0.44$, $CI_{95\%}$: [−0.50, −0.37]), but not levels of MAP ($b = 0.26$, $CI_{95\%}$: [−0.99, 1.51]). Neither the lagged moments of optimistic nor pessimistic expectations moderated the contemporaneous associations (at the next assessment) between reporting a stressor and perceptions of stress, NA, PA, or MAP (all *CIs* cover 0). Full results are displayed in Table 3. A supplementary Poisson regression revealed that the averages of the EMAs for optimistic expectations and pessimistic expectations (*i.e.,* person mean centered) were significantly associated with the number of stressors reported. Specifically, people with higher average optimistic expectation ratings reported fewer stressors ($b = -0.07$, $CI_{95\%}$:[−0.11, −0.03]), whereas people with higher average pessimistic expectation ratings reported more stressors ($b = 0.14$, $CI_{95\%}$:[0.09, 0.18]).

Discussion

Dispositional optimism and pessimism are generalized tendencies toward positive and negative expectations. Prominent theories suggest they are associated with physical and mental health via their influence on stress processes in everyday life. Previous work has mostly examined relatively stable trait assessments of dispositional optimism and pessimism and their associations with stress and health (Puig-Perez et al., 2017; Rasmussen et al., 2009; Scheier & Carver, 2018). In this study, we examined the associations between momentary levels of short-term optimistic and pessimistic expectations with stress processes in everyday life. We found evidence that optimistic and pessimistic expectations varied from moment to moment within individuals, and that momentary levels of optimistic expectations were associated with self-reports of stress and affect. Momentary levels of optimistic and pessimistic expectations, however, were not associated with MAP nor did they moderate reactivity to subsequent stressors. Taken together, these findings suggest that momentary levels of optimistic expectations may be strongly associated with stressor appraisals and affective processes. Such processes, in turn, may accumulate to produce health consequences (as documented in other studies for e.g., (Puig-Perez et al., 2017; Rasmussen et al., 2009; Scheier & Carver, 2018)) over time.

Despite the relative stability of optimistic and pessimistic expectations as exemplified in other studies, the results of this study support the assertion that they also fluctuate in everyday life. This finding is consistent with previous work that has identified a significant amount of within-person changes in traditionally stable traits (e.g., neuroticism; (Segerstrom, 2019), and in dispositional optimism over longer periods of time (Segerstrom & Sephton, 2010). Consistent with previous research, the ICCs of optimistic and pessimistic expectations indicated that the largest proportion of the variance is at the between-person level, suggesting relatively stable traits (Scheier & Carver, 2018; Segerstrom, 2019). However, we extend these findings by demonstrating fluctuations in both optimistic and pessimistic expectations in everyday life using EMA. It is important to note that a portion of this within-person component also includes measurement error, which we were unable to quantify because of the single-item indicators for optimistic and pessimistic expectations.

However, these items were repeatedly sampled over time and – despite potential for poor reliability – we nonetheless observed systematic associations between optimistic and pessimistic expectations with psychological stress processes. These findings provide some preliminary evidence suggesting that variation at the within-person level is not only noise. Additionally, previous work has found that the averages of these momentary levels of optimistic and pessimistic expectations were associated with typical trait measures of dispositional optimism and pessimism, providing preliminary evidence of convergent and divergent validity (Felt et al., 2020).

Interestingly, we also found that within-person levels in optimistic and pessimistic expectations were only weakly correlated (although significantly), suggesting relatively distinct, yet related constructs that was also supported in previous work at the between-person level (Felt et al., 2020). Because the magnitude of the within-person correlations between optimistic and pessimistic expectations were small, collinearity was less of an issue and they were included in models together. Effects for optimistic and pessimistic expectations, while largely mirrored, were only statistically significant for optimistic expectations. That is, momentary optimistic expectations were associated with moments higher PA and lower NA and perceived stress, and a lower probability of reporting a stressor, whereas momentary pessimistic expectations were not significantly associated with any outcome. This parallels findings from several recent studies suggesting that dispositional optimism and pessimism may not merely be opposite ends of a continuum, but rather overlapping constructs that are differentially relevant for health outcomes (Creed et al., 2002; Felt et al., 2020; Scheier & Carver, 2018).

Momentary levels of optimistic expectations were associated with a range of stress processes. Moments that were characterized as more optimistic than typical for a given person were associated with lower odds of subsequently (in the next 45 min or so) reporting a stressor, lower perceptions of stress, lower NA, and higher PA. These within-person findings extend the larger body of literature indicating that optimism is associated with more positive affect and less stress (Chang, 2002; Jones et al., 2017; La Marca et al., 2017) within findings from daily life experiences. The observed effect sizes in this study, although small by conventional standards (i.e., ranging from ±0.03 to ± 0.07), reflect the association at a typical moment. If these effect sizes were constant across moments, for example, the repeated small 'nudges' from momentary optimistic expectations could accumulate to produce much larger effects across time.

These analyses revealed no statistically significant momentary associations of optimistic and pessimistic expectations with ambulatory blood pressure (i.e., MAP). Overall, this is consistent with literature that shows inconsistent associations between dispositional optimism and pessimism with MAP (Räikkönen et al., 1999; Räikkönen & Matthews, 2008; Scheier & Carver, 2018). Our results may indicate that associations with MAP do not manifest at the within-person level on the timeframe that we measured. Associations between optimistic and pessimistic expectations with MAP may arise (and decay) more rapidly; if so, these could be detected on different timescales but would require more intensive measurements (e.g., assessments every 5 minutes). However, our measurement frequencies were already intensive (i.e., every 45 minutes) and more frequent assessments are typically too burdensome for participants. It is also possible that other physiological variables, including heart rate variability or respiratory sinus arrhythmia, may be more sensitive to within-person changes in optimistic or pessimistic expectations, but future research is necessary. Previous work at the between-person level has found that trait-like measures of pessimism, constructed from aggregates of EMAs, was associated with lesser odds of nocturnal MAP dipping, a restorative physiological process, but not daytime averages (Felt et al. 2020) or laboratory assessments of MAP, highlighting that people who have lower pessimism on average may experience health benefits. Regardless, our findings provide evidence that optimistic and pessimistic expectations predict psychological, but not physiological, outcomes at this timescale.

Findings in this study did not support our third hypothesis that moments characterized by higher than typical optimistic or pessimistic expectations would moderate subsequent contemporaneous associations between the report of a stressor with psychological and physiological measures. That is, we expected that moments higher than typical in optimistic expectations would buffer stress responses, and moments higher than typical in pessimistic expectations would exacerbate them; we found no evidence for such processes at this timescale. Other work focusing on a different type of negative expectation (i.e., anticipation of stressors) found that expectations modulated later psychological processes. Specifically, expecting a stressor has been associated with greater negative affect after anticipation, and that negative affect tended to remain elevated after the stressor had ended (Howell & Sweeny, 2016; Neubauer et al., 2018; Sweeny & Falkenstein, 2015). We expected to observe results broadly consistent with this (e.g., looking at moments of higher than typical pessimistic expectations). Our assessment of pessimistic expectations was, however, more general and not tied to specific events (as would be the case in anticipating a specific stressful event). It is possible that moderation of stress reactivity is observed more clearly under circumstances when a more specific event is anticipated, but not in response to general/overall pessimistic expectancies. Another potential explanation for these null findings is that participants in our study reported on whether a stressor occurred in the prior 45 minutes. It is possible that moderating effects only exist when a stressor is more proximal (e.g., in the last 5 minutes). Unfortunately, we were not able to precisely determine the exact moment of the stressor with this data. Future studies could incorporate event-based reports (i.e., report when a stressor has occurred) paired with random EMAs to better approximate when a stressor occurs.

The primary strengths of the study included frequent assessments using EMA and MAP, allowing us to model within-person processes, and the high ecological validity of the work (i.e., being conducted in everyday life). This secondary analysis also has limitations that should be considered. First, there is a possibility of a shared-methods effect, as all statistically significant associations were between self-report measures. Second, we were not able to test more complex (e.g., dynamic, bi-directional) associations between momentary levels of optimistic and pessimistic expectations and stress, which was beyond the scope of this study. Third, it is important to note that our findings may not generalize to other operationalizations of optimism and pessimism described in the literature. For instance, a maladaptive form of optimism involving expecting positive outcomes despite a low likelihood of their occurrence (e.g., unrealistic optimism; (Harris & Hahn, 2011; Weinstein, 1980), may unfold differently throughout daily life. Unrealistic optimism is more likely to occur with infrequent events that are perceived as controllable, which we did not have measures for and was beyond the scope of this study. Future work may consider targeting unrealistic optimism throughout daily life to better understand how frequently it occurs and how it unfolds throughout the day. Finally, despite the high ecological validity and (micro)prospective analyses, the findings in this study are observational in nature; as a result, strong causal claims cannot be established. Despite these limitations, our findings shed important insight into how optimistic and pessimistic expectations may function in everyday life.

Conclusions

This study examined within-person associations of optimistic and pessimistic expectations with stress, affect, and blood pressure. Overall, results indicated that moments of higher than typical optimistic expectations were characterized by lower likelihood of reporting a stressor, lower perceived stress and negative affect, and higher positive affect. Conversely, moments characterized by higher than typical pessimistic expectations were not associated with any affective or biological outcome. Neither momentary optimistic or pessimistic expectations were associated with blood pressure, nor did they moderate psychological or physiological responses to stressors assessed about 45 minutes later. These findings suggest that optimistic expectations are dynamically related to stress and affective processes in daily life; these processes (and associated, such as coping efforts, health behaviors, etc.) may accumulate over time to influence long-term health outcomes.

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Table 1:

Participant Descriptive Statistics

	Variable	N = 300
Gender (n)		
	Female	150
	Male	150
Ethnicity (n)		
	Non-Hispanic	243
	Hispanic/Latinx	57
Race (n)		
	Black/African American	46
	White/Caucasian	220
	Asian/Pacific Islander	6
	American Indian/Alaskan	3
	More than 1	12
	Unknown	13
Age (Mean ± SD)		42 ± 12.76
Blood Pressure		
	SBP Mean *	142.16
	SBP SD (Between/Within)	20.35/17.84
	SBP ICC	0.54
	DBP Mean *	80.62
	DBP SD (Between/Within)	11.38/12.63
	DBP ICC	0.42
BMI (Mean ± SD)		29.3 ± 6.48
Medications (n)		
	Blood pressure	46
	Lipid	41
	Diabetes	14
	Other Cardiac	16

Notes: Mean* indicates cluster adjusted mean, SD = standard deviation, BMI = Body mass index, SBP = systolic blood pressure, DBP = diastolic blood pressure, Between/Within = Between-person variance and within-person variance, ICC = intraclass correlation: (Between Variance / [Between Variance + Within Variance).

Table 2:

Multilevel Model Direct Effects (Research Question 2)

	Random Intercepts and Slopes Model				
	Stressor Occurrence$_t$	**Stress Perceptions$_t$**	**Na$_t$**	**Pa$_t$**	**MAP$_t$**
	O.R.	**b**	**b**	**b**	**b**
	C.I.	**C.I.**	**C.I.**	**C.I.**	**C.I.**
Fixed Effects					
Intercept	0.12 *	1.90 *	1.39 *	4.60 *	88.15 *
	[0.11, 0.14]	[1.80, 2.00]	[1.33, 1.46]	[4.50, 4.71]	[85.89, 90.42]
Optimism$_{t-1}$	0.85 *	−0.10 *	−0.04 *	0.07 *	−0.18
	[0.76, 0.96]	[−0.14, −0.06]	[−0.06, −0.01]	[0.04, 0.10]	[−0.62, 0.25]
Pessimism$_{t-1}$	1.03	0.03	0.01	−0.01	0.21
	[0.87, 1.23]	[−0.03, 0.10]	[−0.02,0.04]	[−0.05, 0.02]	[−0.28, 0.70]
DV$_{t-1}$	1.98 *	0.27 *	0.31 *	0.46 *	0.25 *
	[1.59, 2.46]	[0.24, 0.30]	[0.27, 0.34]	[0.43, 0.49]	[0.22, 0.28]
Posture$_t$	-	-	-	-	4.22 *
	-	-	-	-	[3.45, 4.99]
Activity$_t$	-	-	-	-	2.24 *
	-	-	-	-	[1.51, 2.97]
Consume$_t$	-	-	-	-	0
	-	-	-	-	[−0.01, 0.01]
	σ^2	**σ^2**	**σ^2**	**σ^2**	**σ^2**
	C.I.	**C.I.**	**C.I.**	**C.I.**	**C.I.**
Random Effects					
Intercept	0.82 *	0.66 *	0.27 *	0.79 *	179.38 *
	[0.62, 1.13]	[0.55,0.80]	[0.23, 0.33]	[0.67,0.94]	[151.44, 215.89]
Optimism	0.03	0.01	0.01 *	0.01 *	-
	[0.01, 54.75]	[0.00, 0.17]	[0.01, 0.02]	[0.01, 0.03]	-
Pessimism	0.29 *	0.06 *	0.01 *	0.01 *	-
	[0.15, 0.76]	[0.03, 0.11]	[0.01, 0.02]	[0.01, 0.03]	-
Residual	0.77 *,#	0.80 *	0.15 *	0.30 *	102.74 *
	[0.73, 0.80]	[0.76, 0.84]	[0.14, 0.15]	[0.29, 0.32]	[98.12, 107.68]
	M@	**M+**	**M+**	**M+**	**M+**
	Range	**SE+**	**SE+**	**SE+**	**SE+**
	ICC	**ICC**	**ICC**	**ICC**	**ICC**
Descriptive Statistics	3.69	1.97	1.44	4.6	101.19
	0-25	0.05	0.03	0.05	0.79

Random Intercepts and Slopes Model

	Stressor Occurrence$_t$	Stress Perceptions$_t$	Na$_t$	Pa$_t$	MAP$_t$
	O.R.	b	b	b	b
	C.I.	C.I.	C.I.	C.I.	C.I.
	0.51	0.38	0.59	0.63	0.49

Note: Note:

* indicates statistically significant (95% confidence interval does not cover 0 for linear model predictors and intercepts or 1 for logistic model predictors).

\# dispersion parameter from logistic model suggesting underdispersion because CI limits are below 1. DVt-1 = the lag of the dependent variable. NAt = negative affect at time t. PAt = positive affect at time t. MAPt = mean arterial pressure at time t. Consume indicates whether participants consumed food, alcohol, or caffeine since the previous cuff inflation. OR = odds ratio. CI = 95% confidence interval. b = unstandardized slope. SE = standard error. M@ = average number of stressors reported per person, range= minimum and maximum stressors per person, M+ = cluster adjusted mean. SE+ = cluster adjusted standard error. ICC is the intraclass correlation estimate from the empty model.

Table 3:

Multilevel Model Buffering/Exacerbating Effects (Research Question 3)

	Na_t	Pa_t	Stress $Perceptions_t$	MAP_t
	b C.I.	b C.I.	b C.I.	b C.I.
Fixed Effects				
Intercept	1.38 * [1.32, 1.44]	4.59 * [4.49, 4.70]	1.89 * [1.79, 1.98]	88.47 * [85.80, 91.15]
$Optimism_{t-1}$	−0.038 * [−0.06, −0.01]	0.05 * [0.01, 0.08]	−0.06 * [−0.10, −0.02]	−0.28 [−0.77, 0.22]
$Pessimism_{t-1}$	0.00 [−0.02, 0.03]	0.00 [−0.04, 0.04]	0.02 [−0.04. 0.08]	0.02 [−0.57, 0.61]
Stressor $Occurrence_t$	0.42 * [0.38, 0.46]	−0.45 * [−0.51, −0.38]	1.51 * [1.43, 1.60}	0.27 [−1.00, 1.53]
OptimismXStressor	0.05 [−0.00, 0.11]	−0.07 [−0.15, 0.02]	0.05 [−0.07, 0.17]	0.32 [−1.34, 1.98]
PessimismXStressor	0.00 [−0.06, 0.06]	0.07 [−0.02, 0.17]	−0.03 [−0.16, 0.10]	−0.67 [−2.46, 1.12]
DV_{t-1}	0.31 * [0.27, 0.34]	0.48 * [0.45, 0.51]	0.23 * [0.20, 0.26]	0.25 * [0.21, 0.30]
$Posture_t$	- -	- -	- -	4.33 * [3.49, 5.17]
$Activity_t$	- -	- -	- -	2.21 * [1.40, 3.03]
$Consume_t$	- -	- -	- -	−0.11 [−0.39, 0.16]
	σ^2 C.I.	σ^2 C.I.	σ^2 C.I.	σ^2 C.I.
Random Effects				
Intercept	0.23 * [0.19, 0.27]	0.79 * [0.67, 0.95]	0.60 * [0.51, 0.73]	179.91 * [147.22, 211.26]
Optimism	0.02 * [0.01, 0.03]	0.01 * [0.00, 0.04]	0.02 * [0.01, 0.07]	- -
Pessimism	0.01 * [0.00, 0.03]	0.02 * [0.01, 0.04]	0.03 * [0.02, 0.08]	- -
Residual	0.11 * [0.10, 0.12]	0.27 * [0.25, 0.28]	0.51 * [0.48, 0.53]	103.65 * [120.19, 132.85]

Note:

[*] indicates statistically significant (95% confidence interval does not cover 0 for linear model predictors and intercepts or 1 for logistic model predictors). NA_t = Negative Affect at time t, PAt = Positive Affect at time t, MAP_t = Mean Arterial Pressure at time t, OptimismXStressor = interaction between time-lagged optimistic expectations and the report of a stressor at the following assessment, PessimismXStressor = interaction between time-lagged pessimistic expectations and the report of a stressor at the following assessment, DV_{t-1} = Time lag of the dependent variable, Consume indicates whether participants consumed food, alcohol, or caffeine since the previous cuff inflation, b = unstandardized slope, CI = 95% confidence interval, σ2 = variance of random effects.