Torn Between Valences? Associations Between Mixed Emotions and Well-Being in Stressful and Nonstressful Situations in a Large-Scale Ecological Momentary Assessment Study

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Using a large-scale public-sample ecological momentary assessment study ($N = 710$) collected across 7 days in 2020 and providing 29,820 observations, the present work examines associations between moment-to-moment and day-to-day experiences of mixed emotions with well-being among American adults and whether these relationships would be moderated by stressful situations or adverse life events. Multilevel lagged analyses adjusting for positive emotions, negative emotions, neuroticism, and demographic variability found that mixed emotions were not associated with next-moment physical well-being or next-day social well-being, but were associated with poorer next-day physical health. Reverse pathways in which physical well-being and social well-being on each day predicted reduced mixed emotions on subsequent days were also supported, though the comparable pathway at the moment level was not significant. Moderation analyses further found that whereas adverse life events reported in the previous month did not moderate the associations of mixed emotions with well-being, there were significant interaction terms between moment-level mixed emotions with stressful events reported at the moment predicting next-moment well-being, as well as between day-level mixed emotions with stressful events reported that day predicting next-day physical health. Simple slope analyses found that mixed emotions were associated with poorer next-moment physical well-being and next-day physical health only when stressful events were not reported. We discuss the implications of these findings for conceptualizations of mixed emotions and the potential role of stress as a contextual factor that may alter how mixed emotions are linked to downstream outcomes.

Keywords: adversity, stress, mixed emotions, well-being, ecological momentary assessment

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Whereas earlier approaches have focused on the dichotomy between positive and negative emotions, recent work has increasingly begun to examine emotional states in which these opposing valences co-occur simultaneously. Such experiences have been termed mixed emotions, which are defined as emotional states involving the simultaneous co-occurrence of positive and negative valence (Larsen & McGraw, 2011).[1] Current evidence and theoretical perspectives largely support the existence of mixed emotions (cf. Russell, 2017) across studies of emotions in everyday life (Lange & Zickfeld, 2023; Larsen et al., 2021; Moeller et al., 2018) as well as studies examining the neurobiological structures of the brain involved in generating affective experiences (Hoemann et al., 2017; Vaccaro et al., 2024). However, much remains unknown on the implications of momentary mixed emotional states in day-to-day life and how the contextual factors that such mixed emotions occur within could alter these implications (Moore &

Martin, 2022). We address this gap in the present research, which utilizes a multilevel ecological momentary assessment (EMA) approach to examine whether mixed emotions experienced in the context of everyday life would be associated with well-being outcomes in time-lagged multilevel analyses, as well as whether these associations would be moderated by the occurrence of stressful situations or adverse life events.

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[1] Notably, mixed emotions are distinct from other forms of emotional complexity such as emotion blends, which refer to any co-occurrence between emotions regardless of valence (Berrios, 2019), while emotional variability refers to the tendency of emotions within an individual to fluctuate across time (Eaton & Funder, 2001). Mixed emotions, by contrast, refer specifically to experiences in which opposing valences co-occur simultaneously at a specific point of time.

Mixed Emotions and Well-Being

One notable line of research on mixed emotions involves establishing whether mixed emotions may play a unique explanatory role in various outcomes, though many unanswered questions remain concerning whether they may ultimately result in adaptive or maladaptive well-being outcomes. One perspective which has been termed the integrative perspective suggests that mixed emotions may primarily be adaptive emotional states that facilitate the ability to process complex situations and contradictory information more effectively, in turn enabling more adaptive behaviors and thought processes (Oh & Tong, 2022). For example, empirical evidence supporting this view suggests that mixed emotions may be associated with greater receptivity, enhanced creativity, as well as more effective and accurate judgments (Fong, 2006; Hostler & Berrios, 2021; Rees et al., 2013). Indeed, in various contexts such as graduations (Berrios et al., 2018), psychotherapy (Adler & Hershfield, 2012), as well as during the early stages of the COVID-19 pandemic (Oh & Tong, 2021), mixed emotions have been linked to indices of well-being that span hedonic as well as eudaimonic conceptualizations. Notably, Oh and Tong (2021) found that the positive well-being associations of mixed emotions generalized across American and East Asian participants. These findings thus appear to converge on the possible hypothesis that mixed emotions would ultimately be associated with better well-being outcomes.

An alternative perspective, however, suggests the reverse. Specifically, the conflict perspective argues that mixed emotions are inherently conflicting states that are disruptive and uncomfortable to experience and may thus interfere with the ability to function effectively and experience positive outcomes (Oh & Tong, 2022). For example, Vaccaro et al. (2020) suggested that conflict may be the central defining feature of mixed emotions, which parallels other conceptualizations in which ambivalent states are generally experienced as incohesive and discomfiting (van Harreveld et al., 2009). These perspectives thus challenge the idea that mixed emotions would necessarily be adaptive for well-being. Indeed, in line with these perspectives, other authors have found mixed emotions to be linked to poorer psychological well-being as well as poorer relational well-being in romantic relationships among Western samples (Oh, 2022; Zoppolat, Righetti, Faure, & Schneider, 2024). Moreover, similar evidence linking mixed emotions to poorer life satisfaction has also been reported among East Asian participants (Sun et al., 2021, 2023). In contrast to the integrative perspective, these findings would instead suggest the possible hypothesis that mixed emotions would ultimately be associated with poorer rather than better well-being outcomes.

Further compounding these inconsistencies, we note various methodological limitations that complicate our understanding of mixed emotions and their associations with well-being. For one, some studies have reported associations that do not adjust for positive and negative emotions, which prevents clear conclusions that any associations found are uniquely explained by mixed emotions (Dejonckheere et al., 2019). Moreover, studies specifically focusing on mixed emotions remain relatively rare and much of this evidence involves cross-sectional analyses at a single time point, which may provide only incomplete evidence that does not address prospective relationships over time. Though Oh (2022) also reported longitudinal evidence, their analysis focused on associations across two time points 9 years apart and relied on a relatively imprecise measure that may not accurately assess the co-occurrence of positive and negative affective states. Prospective analyses across shorter time periods using more precise measures of mixed emotions that specifically assess co-occurrence (Berrios et al., 2015; Larsen et al., 2017) may provide more temporally fine-grained evidence concerning how mixed emotions are linked to well-being on a moment-to-moment and day-to-day basis in everyday life.

Stressful Situations and Adversities as Possible Moderators

What could reconcile the inconsistencies between the integrative and the conflict perspectives of mixed emotions? Some researchers have speculated on the possible moderating role of contextual factors. One such speculation is that mixed emotions could be conflicting and discomfiting in naturalistic settings but may become more adaptive specifically in stressful situations (Oh, 2022; Oh & Tong, 2021). These speculations echo those from several other theories such as the dynamic model of affect (Reich et al., 2003) or the coactivation model of healthy coping (Larsen et al., 2003), which similarly argue that mixed affective states could be more adaptive in the context of adversities. Other authors have also argued that mixed emotions may be more helpful in situations that are perceived as particularly complex, where the need to manage diverse sources of information and to address impending challenges effectively becomes particularly central (Rothman et al., 2017). Together, these diverse perspectives suggest the hypothesis that stressful situations or adversities may moderate the relationship between mixed emotions and well-being outcomes, such that this relationship becomes less negative or more positive in stressful situations.

To the extent that this is the case, in the context of stressful situations or adversities, mixed emotions may promote integrative processes that enhance one's ability to make sound judgments and to manage the adversity more effectively (Oh & Tong, 2021; Rees et al., 2013), leading to a net benefit on well-being. Indeed, indirect evidence for this comes from the fact that some of the evidence in which positive well-being outcomes are attributed to mixed emotions have indeed occurred among participants contextualized within stressors, such as the COVID-19 pandemic or the context of undergoing psychotherapy for mental health struggles (Adler & Hershfield, 2012; Oh & Tong, 2021). Conversely, in the absence of a concrete stressor, such integrative processes may be less pertinent to one's well-being, and the conflicting and discomfiting nature of mixed emotions may signal a sense of incoherence in oneself or one's life, leading to a net negative outcome on well-being (Oh, 2022; Vaccaro et al., 2020). However, to our awareness, no direct empirical test of whether the presence or absence of stressors would moderate the well-being associations of mixed emotions has been performed.

We further note that stressful life events could take the form of commonplace everyday hassles and stressors such as strain from household chores or work but could also take the form of major life events and disruptions such as the COVID-19 pandemic, bereavement, or the onset of major health problems, among others. Indeed, daily hassles and major life events have been found to have diverging and independent associations with downstream health and well-being outcomes, suggesting their distinctiveness (De Benedittis & Lorenzetti, 1992; Kanner et al., 1981). In the context of research on mixed

emotions, there is to our awareness little work done to examine daily hassles and stressors, and there is a need to also distinguish whether daily stressors reported in the course of everyday life could differentially moderate the association between mixed emotions and subsequent well-being outcomes compared to the occurrence of major adverse life events.

The Present Research

In the current research, we seek to provide an empirical examination that addresses the above gaps in the literature. We highlight several key considerations. First, by using a large-scale public-sample EMA data set involving multiple assessments of emotions and well-being within each day and across multiple days, the present work provides a more comprehensive and nuanced analysis of how mixed emotions may be linked to well-being outcomes in a highly naturalistic setting. This approach allows prospective analyses of whether mixed emotions would be associated with next-moment or next-day well-being after accounting for autoregressive pathways for well-being, which provides stronger evidence of directionality than cross-sectional approaches (Adachi & Willoughby, 2015). Furthermore, by focusing on processes occurring within each day as well as within the span of a week, the present analysis also provides a highly naturalistic and temporally fine-grained perspective of mixed emotions and their links to well-being on a moment-to-moment and day-to-day basis in everyday life.

Second, consistent with definitions of emotions as temporary episodic states (Scherer, 2022), emotions are operationalized as momentary states in the present work, which allows mixed emotions to be more precisely assessed using the minimum index (MIN; Berrios et al., 2015; Larsen et al., 2017). This approach assesses mixed emotions more precisely than the use of ambivalence indices based on measures of emotions that have a longer reference period[2] (e.g., across 30 days; Oh, 2022). Third, two measures were available for operationalizing well-being: physical health and social well-being. These measures reflect domain-specific assessments of well-being; specifically, physical health, while distinct from psychological conceptualizations of well-being, is implicated in one's ability to function effectively in daily life and is also closely interrelated with subjective well-being (Diener et al., 2017), while social well-being is a component of many eudaimonic operationalizations of well-being (Hofer & Busch, 2011). Finally, we analyze the extent to which two conceptually distinct forms of stressors (stressors in everyday life vs. major adverse life events) may moderate the implications of mixed emotions. Specifically, to examine the occurrence of stressful events in everyday life, we examined whether participants reported undergoing a stressful event at each moment of data collection as well as whether they reported having experienced a stressful event at the end of each day. To examine the occurrence of major life events, we examined whether participants reported a major adversity (e.g., bereavement, new injuries/illnesses) in the month prior to data collection. These three measures were tested as moderators to provide the first empirical test of whether stressful situations or major adverse life events could moderate the relationship between mixed emotions and well-being.

We make the following two key hypotheses in the present research. First, in line with evidence documenting the negative implications of mixed emotions on well-being outcomes in daily life (e.g., Oh, 2022), Hypothesis 1 posits that mixed emotions would

overall be linked to poorer well-being. Second, though the evidence is largely indirect and not entirely clear, we generally expected that mixed emotions would be more adaptive in adversity situations. Hence, Hypothesis 2 posits a significant interaction between mixed emotions and stressful situations as well as major life adversities, such that the relationship between mixed emotions and well-being would primarily be negative in nonstressful situations or non-adversities, whereas this relationship would either be less negative or positive in stressful situations and adversities. In line with previous work, we controlled for positive and negative emotions to establish the unique predictive role of mixed emotions (Adler & Hershfield, 2012; Kreibig & Gross, 2017; Rees et al., 2013). This is also in line with the recommendations of Dejonckheere et al. (2019), who argue that the absence of these controls makes analyses of complex affective states limited in usefulness, given that any resulting findings could be attributable to positive or negative emotions rather than to the unique explanatory role of mixed emotions specifically. Furthermore, given the heterogeneous public sample, we controlled for age, gender, education level, household income, and ethnicity to adjust for demographic variability. Finally, given that trait neuroticism is linked to an increased likelihood of experiencing mixed emotions (Barford & Smillie, 2016), trait neuroticism was included as a covariate to rule out its potential explanatory role.

Method

Participants

Data for this study came from the Understanding America Study (UAS) EMA Burst File which was collected in 2020. The UAS is maintained by the Center for Economic and Social Research at the University of Southern California. The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the University of Southern California or UAS. In total, 710 participants (269 males, 430 females, 11 unspecified; $M_{age} = 61.15$, $SD_{age} = 7.71$, age range: 50–110 years; 603 White, 43 Black, nine American Indian or Alaska Native, 20 Asian, two Hawaiian/Pacific Islander, 31 Mixed) were recruited to participate in a 7-day-long EMA study and provided informed consent before participating. Participants were recruited from the larger UAS panel, which samples respondents aged 18 and above from households in the United States. For the present study, however, only participants above 50 years of age were recruited by UAS, and they needed to have access to a smartphone to be eligible. Participants were required to download an app and would receive six prompts via notifications or text messages each day. The six prompts occurred in regular intervals that were approximately 1.5–2 hr apart. Upon being prompted, participants were given 8 min to respond to a short 2-min questionnaire. A reminder prompt was sent after 4 min, and if participants started the survey,

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[2] By definition, mixed emotions involve the *simultaneous* co-occurrence of positive and negative emotions within a given moment. Ambivalence indices based on measures of positive and negative emotions that span a longer period of time (e.g., 30 days; Oh, 2022) provide only a limited proxy for mixed emotions as such indices assess whether an individual felt both positive and negative emotions over a 30-day period, but not whether positive and negative emotions occurred *simultaneously* during this 30-day period. State measures of positive and negative emotions in which participants report their current emotional states more directly and precisely enable simultaneous occurrence to be determined.

they were then given 8 min to complete the questionnaire. In addition, participants also responded to an end-of-day questionnaire on each of the 7 days of the study. In total, 29,820 prompts were delivered to the participants, and the overall compliance rate, defined as completion of the prompts, was high at 77.50%. Missing data were addressed by performing multiple imputation on all demographics, predictors, and outcome variables prior to analyses, which provides a sophisticated method for addressing missing data that is superior to other imputation methods or listwise deletion even under conditions where data is not missing at random (Sinharay et al., 2001; van Ginkel et al., 2020).[3]

Measures

Emotions

Upon being prompted, participants responded to questionnaires assessing whether they were experiencing various emotions at that moment in time. All items were administered on 101-point slider scales from 0 (*not at all*) to 100 (*extremely*). Positive emotions were assessed using three items ("happy," "cheerful," "relaxed"; α = .87), while negative emotions were assessed using five items ("frustrated," "dejected," "lonely," "stressed," "angry"; α = .85). Items were averaged to compute participants' levels of *moment-level positive emotions* and *moment-level negative emotions*, and these scores were included in all models as covariates. *Moment-level mixed emotions* were then computed by calculating the MIN from moment-level positive emotion and negative emotion scores—this is done by obtaining the smaller of the two scores from state measures of positive emotions and negative emotions. MIN is a co-occurrence index that estimates the lower boundary co-occurrence of positive and negative emotions (Larsen et al., 2017). An individual who reports feeling no emotions (e.g., "0" for positive emotions and "0" for negative emotions), solely positive emotions (e.g., "5" for positive emotions and "0" for negative emotions), as well as solely negative emotions (e.g., "0" for positive emotions and "5" for negative emotions) will be scored "0" on MIN, which is indicative of no co-occurrence or mixed emotions. Conversely, an individual who scores "2" for positive emotions and "5" for negative emotions will be scored "2" on MIN, indicating that this individual is minimally experiencing the co-occurrence of two emotions at the level of the weaker affect. An individual who scores "5" for positive emotions and "6" for negative emotions will be scored "5" on MIN, indicating a relatively more intense co-occurrence whereby both positive emotions and negative emotions are substantially activated concurrently. In this way, MIN is thus able to capture the absence, presence, and intensity of co-occurrence. MIN has been supported by a range of previous work supporting it as a valid and reliable indicator of mixed emotions, and associations between mixed emotions and key outcomes largely converge regardless of whether MIN is used to measure mixed emotions or if mixed emotions are directly assessed using self-report measures (Berrios et al., 2015; Larsen et al., 2017; Oh, 2023). To examine day-level effects, we also computed day-level positive emotions, day-level negative emotions, and day-level mixed emotions on each of the 7 days by aggregating participants' moment-level emotion scores for each day. Scores for day-level positive and negative emotions were included in all day-level analytic models as covariates.

Moment-Level Well-Being

Moment-level well-being was operationalized based on two items assessing whether participants were experiencing negative bodily symptoms ("bodily pain," "fatigued"; α = .64) at the point of time that they received the prompt. Similar measures have been used in experience sampling frameworks to assess moment-to-moment physical symptoms and well-being as well (Band et al., 2017). The two items were administered on 101-point slider scales from 0 (*not at all*) to 100 (*extremely*). Scores were reverse-coded so that higher scores reflect better well-being, and the two items were averaged to calculate moment-level well-being.

Day-Level Well-Being

Day-level well-being was operationalized in two ways: *day-level physical health* and *day-level social well-being*. Three measures were available for measuring day-level physical health. First, the same two items assessing moment-level negative bodily symptoms were also administered in the end-of-day survey, but participants instead indicated whether these items reflected how they felt that day. These two items were averaged. Second, participants' scores for moment-level well-being across multiple prompts for each day were aggregated to provide another index of day-level negative bodily symptoms. Third, participants indicated how good their health was that day on a 5-point Likert scale from 1 (*poor*) to 5 (*excellent*). The three measures were standardized and reverse-coded so that higher scores reflect better physical health before being averaged to provide an overall index of day-level physical health (α = .86). Day-level social well-being was available only in the end-of-day survey and was calculated based on five items administered on 7-point Likert scales. These items assessed participants' satisfaction with their social relationships that day (e.g., "How satisfied are you with your social interactions that day?"), and the five items were averaged (α = .91).

Stressful Events and Adversities

Three available measures were used to operationalize whether participants underwent a stressful situation or major adverse life event. The occurrence of a stressful situation in everyday life was assessed in two ways. First, *moment-level stressful event* was measured based on one item asking participants whether they had experienced a stressful event just before they received the prompt (1 = *yes*, 0 = *no*). Second, *day-level stressful event* was measured using one item administered during the end-of-day survey asking participants whether they had experienced a stressful event that day (1 = *yes*, 0 = *no*). The occurrence of a *major adversity in the past month* was measured based on eight items asking participants whether they had experienced various serious adversities in the

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[3] It is common for some EMA studies to utilize compliance thresholds to exclude participants before performing imputation (e.g., 50%), though this approach has been criticized given that it can bias the sample and lead to a skewed and nonrepresentative sample (van Berkel & Kostakos, 2021). Thus, all participants were subject to imputation without compliance thresholds. Additional analyses were performed to test the robustness of the findings when listwise deletion is applied instead—these are reported in Supplemental Analyses A. Most key conclusions remained similar to those reported in the main analyses, suggesting that the major conclusions are robust regardless of how missing data is addressed.

past month (e.g., "suffered a new illness/injury," "death of someone close to you," "serious marital difficulties"). As the sample sizes of people who indicated "Yes" to each item were extremely small, analyses of individual items were not tenable. As such, we summed their responses to the eight items and re-coded it such that a score of "1" represented individuals who responded "Yes" to at least one of the eight items, while a score of "0" represented individuals who did not respond "Yes" to any of the items.

Covariates

Age, gender (1 = male, 0 = female), education level (1 = less than first grade to 16 = Doctorate degree), annual household income (1 = less than $5,000 to 14 = $150,000 or more),[4] and ethnicity (1 = White, 0 = non-White) were assessed as demographic covariates. Trait neuroticism was assessed using eight items (e.g., "is depressed, blue"), of which three were reverse-coded (e.g., "is emotionally stable, not easily upset"). The eight items were averaged to compute trait neuroticism (α = .84).

Transparency and Openness

We transparently report sample size considerations and data availability. The available sample size and number of observations far exceed sample size recommendations for multilevel modeling made in previous research (Brysbaert & Stevens, 2018; Maas & Hox, 2005; Usami, 2014), which enables adequately statistically powered tests of both cross-sectional and time-lagged associations between mixed emotions and well-being in a naturalistic setting. Moreover, the available sample size is also able to detect both reverse-pattern and attenuated interactions of a small-to-medium effect size with .80 power (Sommet et al., 2023). No preregistration was made. Data and materials for the study are available at https://uasdata.usc.edu/index.php (Kapteyn et al., 2024) while analysis codes are uploaded at https://osf.io/u896m (Oh, 2025).

Results

Descriptive statistics are reported in Table 1, while correlation matrices are reported in Supplemental Tables S1–S3.

Lagged Analyses of Mixed Emotions and Subsequent Well-Being

To test prospective associations between mixed emotions and subsequent well-being, we performed multilevel lagged analyses based on Nezlek's (2011) recommendations. At the moment level, we performed a three-level multilevel model using the NLME package on R. Each session of data collection was nested within the day of data collection, which was in turn nested within the individual. An unconditional model was fit Akaike information criterion = 186,738.8; Bayesian information criterion = 186,771.3], and at the individual level, the intraclass correlation coefficient (ICC) was 0.63, indicating that 63% of variability in next-moment physical well-being was explained by individual differences, while at the day level, ICC was 0.09, indicating that 9% of variability in next-moment physical well-being was explained by day-to-day differences. At the day level, we performed a two-level multilevel model in which each

Table 1
Descriptive Statistics for All Key Variables

Variable	M	SD	Range
Age	61.15	7.71	50–110
Gender	269 male, 430 female		
Education level	11.70	2.07	4–16
Household income	12.54	3.37	1–16
Neuroticism	2.51	0.79	1–5
Ethnicity	603 White, 105 non-White		
Moment-level positive emotions	63.27	17.18	0–100
Moment-level negative emotions	12.79	13.05	0–99.4
Moment-level mixed emotions	11.59	10.11	0–75.4
Moment-level well-being	79.67	16.88	0–100
Day-level positive emotions	63.27	14.30	5.28–100
Day-level negative emotions	12.79	10.62	0–75
Day-level mixed emotions	11.59	8.19	0–54.08
Day-level physical health	0.00	0.87	−3.95–1.38
Day-level social well-being	5.38	1.18	1–7
Moment-level stressful event	3,386 yes, 19,447 no		
Day-level stressful event	1,542 yes, 3,240 no		
Adverse event during the past month	148 yes, 551 no		

day of data collection was nested within the individual. The ICC of the unconditional model for next-day physical health (Akaike information criterion = 126,811.9; Bayesian information criterion = 126,836.3) was 0.91, while the ICC of the unconditional model for next-day social well-being (Akaike information criterion = 170,869.9; Bayesian information criterion = 170,894.3) was 0.70, indicating that 91% and 70% of variability in next-day physical health and next-day social well-being were respectively explained by individual differences. We analyzed associations between mixed emotions at each moment and physical well-being in the subsequent moment while controlling for current physical well-being, as well as associations between mixed emotions on each day and physical health and social well-being on the subsequent day, controlling for current physical health or social well-being. Age, gender, education, income, ethnicity, trait neuroticism, positive emotions, and negative emotions were included as covariates in all analyses. Despite mathematical and conceptual overlaps between mixed emotions and positive/negative emotions, no severe multicollinearity occurred across all models (all variance inflation factors < 4.2). Reverse-directional associations between physical health and mixed emotions in the subsequent moment as well as associations between physical health and social well-being on each day and mixed emotions on the subsequent day were also examined, controlling for the auto-regressive pathways for mixed emotions. The Benjamini–Hochberg procedure, which provides a high-powered approach to correcting the false-discovery rate, was applied to correct for multiple comparisons (Benjamini & Hochberg, 1995).

At the moment level, as shown in Table 2, controlling for previous-moment physical well-being, lagged associations between mixed emotions and physical well-being in the subsequent moment were non-significant. The reverse-directional association between physical well-being and subsequent mixed emotions was also non-significant upon controlling for previous-moment mixed emotions.

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[4] Education and income were analyzed as continuous variables, given previous evidence that ordinal variables measured with at least six or more categories can be accurately modelled as continuous variables (Rhemtulla et al., 2012).

Table 2

Three-Level (Moment Nested Within Day of Data Collection, Nested Within Person) Multilevel Lagged Analyses Predicting Next-Moment Well-Being and Next-Moment Mixed Emotions

Predictor	DV: Next-moment well-being (AIC = 185,778.2; BIC = 185,891.9)					DV: Next-moment mixed emotions (AIC = 168,643.8; BIC = 168,757.5)				
	b	SE	p	β	95% CI	b	SE	p	β	95% CI
Age	0.06	0.05	.20	0.03	[−0.03, 0.16]	−0.04	0.03	.098	−0.03	[−0.09, 0.01]
Gender	−0.07	0.77	.96	−0.002	[−1.59, 1.45]	1.46***	0.41	<.001	0.07	[0.66, 2.27]
Education level	−0.35	0.19	.068	−0.04	[−0.72, 0.03]	0.52***	0.10	<.001	0.11	[0.32, 0.72]
Household income	0.68***	0.12	<.001	0.13	[0.45, 0.91]	−0.27***	0.06	<.001	−0.09	[−0.4, −0.15]
Neuroticism	−0.41***	0.06	<.001	−0.15	[−0.53, −0.29]	0.36***	0.03	<.001	0.22	[0.29, 0.42]
Ethnicity	−0.73	1.03	.48	−0.02	[−2.75, 1.29]	0.05	0.54	.93	0.002	[−1.02, 1.11]
Moment-level positive emotions	0.02***	0.01	<.001	0.02	[0.01, 0.04]	−0.01	0.01	.066	−0.01	[−0.02, 0.001]
Moment-level negative emotions	0.05***	0.01	<.001	0.04	[0.03, 0.08]	0.06***	0.01	<.001	0.08	[0.05, 0.08]
Moment-level well-being	0.27***	0.01	<.001	0.26	[0.25, 0.28]	−0.001	0.01	.85 (.85)	−0.001	[−0.01, 0.01]
Moment-level mixed emotions	−0.01	0.01	.55 (.55)	−0.01	[−0.04, 0.02]	0.12***	0.01	<.001	0.12	[0.1, 0.14]

Note. p values for tests of hypotheses involving mixed emotions were adjusted using Benjamini and Hochberg's procedure to correct for multiple comparisons. Unadjusted p values are provided in parentheses. Gender was coded with 1 = *male*, 0 = *female*; while ethnicity was coded with 1 = *White*; 0 = *non-White*. DV = dependent variable; AIC = Akaike information criterion; BIC = Bayesian information criterion; SE = standard error; CI = confidence interval.
*** $p < .001$.

At the day level, as shown in Table 3, controlling for previous-day physical health or social well-being, mixed emotions were associated with poorer next-day physical health but were not significantly associated with next-day social well-being. Reverse-directional lagged associations were significantly negative for physical health predicting next-day mixed emotions as well as social well-being predicting next-day mixed emotions. Hypothesis 1 was thus supported only for next-day physical health, and there were indications that at the day level,

Table 3

Two-Level (Day of Data Collection Nested Within Person) Multilevel Lagged Analyses Predicting Next-Day Physical Health, Next-Day Social Well-Being, and Next-Day Mixed Emotions

Predictor	DV: Next-day physical health (AIC = 126,231.8; BIC = 126,337.7)					DV: Next-day mixed emotions (AIC = 142,137.2; BIC = 142,243.1)				
	b	SE	p	β	95% CI	b	SE	p	β	95% CI
Age	0.05	0.03	.15	0.04	[−0.02, 0.11]	−0.05	0.03	.084	−0.04	[−0.10, 0.01]
Gender	−0.03	0.52	.95	−0.002	[−1.06, 0.99]	1.52***	0.42	<.001	0.09	[0.69, 2.35]
Education level	−0.15	0.13	.26	−0.03	[−0.4, 0.11]	0.56***	0.10	<.001	0.14	[0.36, 0.77]
Household income	0.55***	0.08	<.001	0.21	[0.39, 0.71]	−0.26***	0.06	<.001	−0.11	[−0.38, −0.13]
Neuroticism	−0.35***	0.04	<.001	−0.25	[−0.43, −0.27]	0.37***	0.03	<.001	0.28	[0.30, 0.43]
Ethnicity	0.12	0.69	.86	0.001	[−1.24, 1.48]	−0.07	0.56	.91	−0.003	[−1.17, 1.03]
Day-level positive emotions	−0.002	0.003	.59	−0.003	[−0.01, 0.01]	0.03***	0.004	<.001	0.06	[0.03, 0.04]
Day-level negative emotions	0.02**	0.01	.002	0.03	[0.01, 0.03]	0.14***	0.01	<.001	0.18	[0.12, 0.16]
Day-level physical health	0.13***	0.01	<.001	0.13	[0.12, 0.15]	−0.02*	0.01	.017 (.011)	−0.02	[−0.04, −0.01]
Day-level mixed emotions	−0.02*	0.01	.017 (.006)	−0.02	[−0.03, −0.01]	0.05***	0.01	<.001	0.05	[0.03, 0.07]

Predictor	DV: Next-day social well-being (AIC = 170,652.2; BIC = 170,758.1)					DV: Next-day mixed emotions (AIC = 142,073.2; BIC = 142,179.1)				
	b	SE	p	β	95% CI	b	SE	p	β	95% CI
Age	0.07	0.04	.080	0.05	[−0.01, 0.16]	−0.05	0.03	.085	−0.04	[−0.10, 0.01]
Gender	−2.30**	0.68	.001	−0.09	[−3.63, −0.97]	1.46**	0.42	.001	0.09	[0.64, 2.28]
Education level	−0.40*	0.17	.017	−0.07	[−0.73, −0.07]	0.56***	0.10	<.001	0.14	[0.35, 0.76]
Household income	0.43***	0.10	<.001	0.12	[0.23, 0.63]	−0.26***	0.06	<.001	−0.11	[−0.38, −0.13]
Neuroticism	−0.61***	0.05	<.001	−0.32	[−0.71, −0.50]	0.36***	0.03	<.001	0.28	[0.29, 0.42]
Ethnicity	0.62	0.90	.49	0.02	[−1.15, 2.39]	−0.05	0.56	.93	−0.002	[−1.15, 1.04]
Day-level positive emotions	0.06***	0.01	<.001	0.07	[0.04, 0.07]	0.04***	0.004	<.001	0.07	[0.03, 0.05]
Day-level negative emotions	0.03*	0.02	.040	0.03	[0.001, 0.06]	0.14***	0.01	<.001	0.18	[0.12, 0.16]
Day-level social well-being	0.02**	0.01	.004	0.02	[0.01, 0.03]	−0.03***	0.004	<.001 (<.001)	−0.04	[−0.04, −0.02]
Day-level mixed emotions	0.02	0.02	.26 (.17)	0.02	[−0.01, 0.06]	0.05***	0.01	<.001	0.05	[0.03, 0.07]

Note. p values for tests of hypotheses involving mixed emotions were adjusted for using Benjamini and Hochberg's procedure to correct for multiple comparisons. Unadjusted p values are provided in parentheses. Gender was coded with 1 = *male*, 0 = *female*; while ethnicity was coded with 1 = *White*; 0 = *non-White*. DV = dependent variable; AIC = Akaike information criterion; BIC = Bayesian information criterion; SE = standard error; CI = confidence interval.
* $p < .05$.   ** $p < .01$.   *** $p < .001$.

better well-being may be prospectively associated with reduced next-day mixed emotions.

Moderation Analyses

We next examined the interaction terms between mixed emotions and stressful events or adversities predicting subsequent well-being, which are summarized in Table 4. The interaction term between moment-level mixed emotions and moment-level stressful events predicting subsequent physical well-being was significant. Simple slope analyses indicated that among participants who did not report a stressful event in a given moment, mixed emotions were associated with poorer physical well-being in the next moment ($b = -0.48$, $SE = 0.16$, $p = .002$, 95% confidence interval [CI] [-0.79, -0.17]). However, among participants who did report a stressful event, this association became nonsignificant ($b = -0.03$, $SE = 0.19$, $p = .86$, 95% CI [-0.40, 0.33]). The interaction terms between moment-level mixed emotions and day-level stressful events as well

Table 4

Interaction Terms Between Mixed Emotions and Stressful Events or Adversities

| | DV: Next-moment well-being | | | | |
Predictor	b	SE	p	β	95% CI
Moment-level mixed emotions	−0.48**	0.16	.002	−0.03	[−0.79, −0.17]
Moment-level stressful event	0.06	0.29	.84	0.001	[−0.51, 0.62]
Moment-Level Mixed Emotions × Moment-Level Stressful Event	0.45*	0.18	.023 (.012)	0.01	[0.10, 0.79]

| | DV: Next-moment well-being | | | | |
Predictor	b	SE	p	β	95% CI
Moment-level mixed emotions	−0.09	0.16	.58	−0.004	[−0.41, 0.23]
Day-level stressful event	−0.72***	0.20	<.001	−0.02	[−1.11, −0.33]
Moment-Level Mixed Emotions × Day-Level Stressful Event	0.07	0.15	.63 (.63)	0.002	[−0.23, 0.38]

| | DV: Next-moment well-being | | | | |
Predictor	b	SE	p	β	95% CI
Moment-level mixed motions	−0.13	0.15	.41	−0.01	[−0.43, 0.17]
Adversity in the previous month	−0.80	0.90	.38	−0.02	[−2.57, 0.97]
Moment-Level Mixed Emotions × Adversity in Previous Month	0.20	0.21	.50 (.33)	0.01	[−0.21, 0.61]

| | DV: Next-day physical health | | | | |
Predictor	b	SE	p	β	95% CI
Day-level mixed emotions	−0.19**	0.06	.003	−0.02	[−0.31, −0.07]
Day-level stressful event	−0.07	0.05	.14	−0.004	[−0.17, 0.02]
Day-Level Mixed Emotions × Day-Level Stressful Event	0.16**	0.04	.002 (<.001)	0.01	[0.07, 0.25]

| | DV: Next-day physical health | | | | |
Predictor	b	SE	p	β	95% CI
Day-level mixed emotions	−0.15*	0.06	.021	−0.02	[−0.27, −0.02]
Adversity in the previous month	−1.04	0.61	.092	−0.05	[−2.25, 0.17]
Day-Level Mixed Emotions × Adversity in Previous Month	−0.02	0.08	.78 (.78)	−0.001	[−0.18, 0.14]

| | DV: Next-day social well-being | | | | |
Predictor	b	SE	p	β	95% CI
Day-level mixed emotions	0.17	0.15	.25	0.02	[−0.12, 0.47]
Day-level stressful event	−0.26*	0.12	.032	−0.01	[−0.50, −0.02]
Day-Level Mixed Emotions × Day-Level Stressful Event	0.21	0.11	.075 (.056)	0.01	[−0.01, 0.42]

| | DV: Next-day social well-being | | | | |
Predictor	b	SE	p	β	95% CI
Day-level mixed emotions	0.12	0.16	.44	0.02	[−0.18, 0.42]
Adversity in the previous month	−0.81	0.79	.31	−0.03	[−2.37, 0.75]
Day-Level Mixed Emotions × Adversity in Previous Month	0.35	0.20	.22 (.075)	0.01	[−0.04, 0.74]

Note. p values for tests of hypotheses involving mixed emotions were adjusted using Benjamini and Hochberg's procedure to correct for multiple comparisons. Unadjusted p values are provided in parentheses. Age, gender, education, income, neuroticism, ethnicity, positive emotions, and negative emotions were controlled for in all analyses. DV = dependent variable; SE = standard error; CI = confidence interval.
* $p < .05$. ** $p < .01$. *** $p < .001$.

as adversity in the past month were nonsignificant for predicting physical well-being in the next moment. The interaction term between day-level mixed emotions and day-level stressful event was significant for next-day physical health but was nonsignificant for next-day social well-being. Simple slope analyses indicated that among participants who did not report a stressful event that day, mixed emotions were associated with poorer next-day physical health ($b = -0.19$, $SE = 0.06$, $p = .003$, 95% CI [-0.31, -0.07]). However, among participants who did report a stressful event that day, this association became nonsignificant ($b = -0.03$, $SE = 0.07$, $p = .63$, 95% CI [-0.17, 0.10]). Finally, the interaction terms between day-level mixed emotions and adversity in the past month were nonsignificant for both next-day physical health and next-day social well-being.

Hypothesis 2 was thus partially supported for moment-level physical well-being as well as day-level physical health, such that mixed emotions were prospectively associated with poorer subsequent well-being only when participants did not report undergoing a stressful event.[5]

Discussion

Overall, Hypothesis 1 was only partially supported for one outcome. Specifically, mixed emotions were significantly associated with poorer next-day physical health after controlling for autoregressive pathways due to physical health. However, comparable lagged associations were nonsignificant for physical well-being at the moment level and next-day social well-being. There was also evidence that better well-being at the day level may be associated with reduced mixed emotions on subsequent days, suggesting the potential for reverse directionality at the day level. Hypothesis 2 was partially supported for two outcomes, such that proximal stressful events at the moment level moderated the relationship between moment-level mixed emotions and subsequent well-being, and stressful events at the day level also moderated the relationship between day-level mixed emotions and next-day physical health. Specifically, mixed emotions were associated with poorer next-moment physical well-being only when participants did not report a stressful event before the prompt; and mixed emotions were also associated with poorer next-day physical health only when participants did not report undergoing a stressful event that day. The interaction term for next-day social well-being was in the same trend but did not approach significance. All interaction terms for major adverse events in the past month were nonsignificant as well.

The pattern of evidence suggests a complex view of how mixed emotions may be related to well-being. Prospective analyses of the main effects provided only weak support that mixed emotions were linked to poorer next-day physical health but not next-moment physical well-being or next-day social well-being. Speculatively, one possibility is that mixed emotions could have more debilitative associations with physical wellness when experienced over a longer time period as the distress of affective contradiction and incoherence may be cumulative over time (van Harreveld et al., 2009). Thus, whereas moment-to-moment mixed emotions could be less likely to be linked to physical wellness shortly after, the cumulative experience of mixed emotions over an entire day may have more substantial implications for physical well-being. However, given that fine-grained differences in whether the implications of mixed emotions differ depending on the reference period (e.g., within

days, across days, across weeks, etc.) remain poorly understood, this speculation remains to be further tested. Moreover, at the day level, there was evidence that better well-being may predict reduced mixed emotions on subsequent days instead, which aligns with previous evidence of bidirectional associations between emotional ambivalence and psychological well-being (Oh, 2022). Indeed, recent evidence has also been surfaced to suggest that well-being may be predictive of affective outcomes rather than the reverse (Joshanloo, 2024), and the present findings corroborate this view.

However, the significant interactions suggest that the main effect analyses may provide an incomplete interpretation. Specifically, moderation analyses found that mixed emotions were indeed negatively associated with next-moment well-being but only among individuals who did not report undergoing a stressful event before the prompt. Similarly, mixed emotions were associated with poorer next-day physical health only among individuals who did not report a stressful event that day. Thus, when mixed emotions are experienced naturalistically and outside of stressful situations, the findings align with the conflict perspective which suggests that mixed emotions fundamentally involve a sense of contradiction and incoherence and are uncomfortable states to experience (Vaccaro et al., 2020; van Harreveld et al., 2009). An ongoing experience of mixed emotions can thus be a primarily distressing experience that may interfere with the general human need for coherence and consistency, thereby interfering with well-being outcomes, as has also been reported previously (Oh, 2022, 2023; Sun et al., 2021).

Conversely, in a stressful situation, mixed emotions no longer appear to be as harmful to subsequent well-being, which supports the view that mixed emotions may serve adaptive integrative functions that enhance one's ability to process an ongoing adverse situation, make better judgments, and thereby exhibit more effective coping with stressful situations (Larsen et al., 2003; Rees et al., 2013). In nonstressful situations, these characteristics may not be highly relevant given that there are fewer environmental pressures that require integrative processing to promote better coping. As a result, the inherent contradiction of experiencing mixed emotions takes precedence and may lead to distress and negative well-being outcomes (van Harreveld et al., 2009). However, in stressful situations where overarching environmental threats to one's wellness are present, the functional aspects of mixed emotions serve a clearer role in allowing one to enact processes that are beneficial for resolving the psychological threats resulting from these stressors, such as receptivity and sound judgments (Rees et al., 2013). These functional benefits may in turn mitigate the discomfort and distress from the inherent contradiction of mixed emotions, alleviating their negative associations with subsequent well-being.[6]

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[5] Given the inherent weaknesses of cross-sectional analyses, we focused on prospective lagged analyses in our main analyses, which allows better tests of directional associations between mixed emotions and subsequent well-being. Nevertheless, in the interest of transparency, we also report analyses performed at the cross-sectional level under Supplemental Analyses B.

[6] Nevertheless, the present findings stop short of providing unambiguous support for the integrative perspective in contexts of stress, given that associations between mixed emotions and subsequent well-being did not turn positive among participants who reported stressful events. Thus, mixed emotions were not quite linked to improved well-being among participants who reported undergoing a stressful event but were simply no longer linked to poorer well-being.

It is notable that Hypothesis 2 was not supported when examining major life adversities in the past month as potential moderators. While this prima facie appears inconsistent with previous evidence suggesting that major life events such as the COVID-19 pandemic or ongoing mental health challenges could provide contexts in which mixed emotions are more beneficial for well-being outcomes (Adler & Hershfield, 2012; Oh & Tong, 2021), it is plausible that the temporal proximity of the adversity could explain this finding. Given that major life events were assessed based on their occurrence in the past month, it is possible that any moderating effects could have been attenuated. We found that more proximal stressful situations showed more evidence supporting the proposed interaction pattern, and it is possible that ongoing major life events could have more strongly shown a similar interaction pattern as opposed to major life events in one's recent past. Indeed, we similarly found that associations between moment-level mixed emotions and subsequent well-being were moderated only by proximal assessments of stress at the moment level but not at the day level. Thus, we may further speculate that state measures of mixed emotions and their associations with well-being may be moderated primarily by proximal rather than distal experiences of stress, though this remains to be further replicated.

We acknowledge, however, that the evidence is not perfectly consistent across different measures and moderators. For example, the moderating pattern was only marginally significant for social well-being. Thus, the present work provides only partial and preliminary indications that stressful situations could mitigate the negative well-being implications of mixed emotions. An important question thus remains to be answered: what might more consistently moderate the extent to which mixed emotions are adaptive versus maladaptive? We suggest several speculations. One possibility is that specific types of adversity may more strongly moderate the implications of mixed emotions. The early days of the COVID-19 pandemic, for example, were a relatively unique and unprecedented stressor involving a great deal of uncertainty, confusion, and contradictory sources of information that individuals had to process and reconcile. The integrative functions of mixed emotions which may be especially useful in processing contexts involving contradictory sources of information may have been especially beneficial in this particular context (Oh & Tong, 2021; Rees et al., 2013). The measures of stressful situations that were available in the present work provide only a generic assessment of whether participants experienced a stressful event but provided little information about what specific event they experienced. Indeed, Oh and Tong (2021) specifically asked participants whether they felt mixed emotions "as a result of [the COVID-19] outbreak." In contrast to measures that simply ask participants whether they experienced various emotions without a specific context, these measures may tap into mixed emotions that are directly contextualized within unique events or stressors that could play a more substantial moderating role. Further research is required to examine this possibility.

A second possibility is that there may be a need to differentiate the implications of mixed emotions across different measures of well-being. One such differentiation involves *experienced* well-being versus *action-oriented* well-being involving motivational states that may lead to adaptive outcomes. For example, Berrios et al. (2018; Study 1) operationalized well-being in terms of activities undertaken to pursue hedonic and eudaimonic well-being, which is a relatively action-oriented measure. Conversely, the bivariate association

between mixed emotions and experienced meaning in life in their study was negative. Zoppolat, Righetti, Đurić et al. (2024) also found evidence that ambivalent states can simultaneously have both positive and negative implications for relational well-being depending on the measure, such that ambivalence led to greater constructive as well as destructive behaviors. Indeed, Oh and Tong (2022) have similarly argued that conflict and integrative effects resulting from mixed emotions are not mutually exclusive and may coexist. A final possibility is that in line with recent calls on the need to examine mixed-emotion specificity, analyses that differentiate specific types of mixed emotions may provide a more fine-grained and nuanced approach that better identifies variation between specific mixed emotions and their associations with well-being (Oh & Tong, 2022).[7] For example, Oh and Tong (2023) provided initial evidence that mixed emotion pairs involving more contradictory affective states such as "gratitude-anger" may be more detrimental to well-being outcomes compared to less contradicting mixed emotion pairs, such as "gratitude-guilt." More evidence is required to examine these specific variants of mixed emotions and their diverging well-being implications.

Limitations and Constraints to Generality

We highlight several limitations to the present analyses. First, true causality is difficult to conclude without strong experimental evidence. This is difficult in the context of well-being research, given that lab-based inductions of mixed emotions are necessarily artificial, and experimental designs may not adequately capture naturalistic relationships that would generalize to actual experiences in real life. Second, the use of MIN to index mixed emotions not only has many strengths (Larsen et al., 2017) but could also have several limitations on the basis that it could underestimate mixed emotions (Berrios et al., 2015) and could be more likely to be multicollinear with positive and negative emotions in regression models, leading to reduced statistical power (Oh, 2023). The latter is less of an issue in the present work given that there was no strong evidence of multicollinearity and given that the large sample size available mitigates such losses of statistical power to some extent (Mason & Perreault, 1991). Nevertheless, future work using similarly sophisticated EMA approaches can consider using self-reported mixed emotion measures (e.g., Barford & Smillie, 2016) as an alternative to MIN. Third, given that the present work focuses only on general mixed valence, two operationalizations of well-being, and a generic definition of stressful events or adversities, there remain key theoretical gaps that are not addressed by the present analyses. For example, might specific forms of mixed emotions exhibit more nuanced associations depending on the context, such that they could be beneficial for certain types of well-being such

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[7] Though the relatively limited number of emotion items makes a comprehensive examination infeasible, we explored whether categorizing the available emotion items based on arousal and examining specific combinations of mixed emotions could lead to more nuanced findings. We found no clear evidence of this (reported in Supplemental Analyses C), and the main analyses that focused on mixed emotions as a whole thus provide a more parsimonious analysis and interpretation of the data. Given that the present measures provide only a very limited ability to examine specificity in mixed emotions, future work that more precisely assesses different types of mixed emotions should be performed to better address this issue.

as meaning-making in specific forms of adversity such as the experience of a loss? Relatedly, various researchers have critiqued the heterogeneity with which well-being has been defined and operationalized and have argued for the need to make fine-grained examinations that encompass diverse conceptualizations and operationalizations of well-being (Forgeard et al., 2011). We similarly argue that there is a need to move from general definitions such as those utilized in the present work to more precise ones, which in our view would be a key direction that may better shed light on the nuances with which specific mixed emotions could be linked to specific well-being outcomes within specific contexts.

Finally, we highlight key constraints to generalizability. In particular, the present analyses focus on a Western sample that is relatively older, and it is unclear if the findings reported would generalize to other cultures or to younger samples. Notably, age-related increases in mixed emotions have been reported by some researchers, though the evidence is mixed (Grossmann & Ellsworth, 2017). Older adults also tend to exhibit more effective emotion regulation (Urry & Gross, 2010), which could suggest that they may resolve any discomfort related to mixed emotions more rapidly and effectively—this could also explain why lagged associations across time were less strongly supported in the present analyses given the relatively older demographic of the sample. Moreover, East Asians have been found to experience mixed emotions more frequently as well as find them less uncomfortable due to a greater tolerance for contradictions (Mesquita et al., 2016; Miyamoto et al., 2010; Zheng et al., 2021), which suggests that mixed emotions could be less harmful or more beneficial in East Asian cultures (Miyamoto & Ryff, 2011). This possibility is called into question, however, by findings of negative associations between mixed emotions and life satisfaction among East Asians as well (e.g., Sun et al., 2021). More extensive comparisons across age groups and cultures in future work may better clarify the extent to which mixed emotions are beneficial or harmful across different individuals, as well as whether situational factors may differentially moderate these associations across different populations.

There is mounting evidence to support the importance of mixed emotions in everyday affective experiences as well as their potential explanatory role in various key outcomes. Building on this line of research, the present work provides the first direct test examining the associations between mixed emotions and well-being across stressful and nonstressful situations using a sophisticated large-scale experience sampling study. We found suggestive evidence that mixed emotions were indeed more detrimental to later physical well-being and next-day physical health in nonstressful situations compared to stressful situations. Our findings add nuance to existing conceptualizations on mixed emotions and further suggest the need for more precise examinations to further shed light on complex associations between distinct mixed emotions and well-being outcomes across a wide range of contexts.

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