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Does trait self-esteem serve as a protective factor in maintaining daily affective well-being? Multilevel analyses of daily diary studies in the US and Singapore

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ABSTRACT

Research suggests that self-esteem could be a protective factor in stressful or unfavorable situations. However, little research has been done on the buffering role of self-esteem in the context of daily stressors on affective reactivity. Three daily diary studies (of which two were conducted in Singapore and one in the United States) were carried out to examine this relationship. In all three studies, trait self-esteem was measured at baseline. Subsequently, daily assessment was conducted on exposure to daily stressors, and positive and negative affect for seven to eight days. Multilevel modeling showed that trait self-esteem did not moderate the relationship between daily stressor exposure and daily affect. An internal meta-analysis aggregating the findings of all three studies was also consistent with our findings. These findings are contrary to previous literature surrounding the stress-buffering role of self-esteem.

Daily stressors—the routine problems and minor unexpected challenges of everyday life (Almeida, 2005; Lazarus, 2006)—have long been known to be associated with negative consequences for the affective well-being of individuals. Despite seeming trivial in nature, the cumulative impacts of these minor life events (Almeida, 2005; Almeida et al., 2011) have sometimes been found to be more detrimental than single major stressor events on outcomes such as life satisfaction, emotional well-being, and even psychopathological symptoms (e.g., depressive symptoms; Daniels & Moos, 1990; DuBois et al., 1992; Malla & Norman, 1992). A growing body of literature (e.g., McCullough et al., 2000; Polk et al., 2020; Sin et al., 2015) has thus begun emphasizing the importance of considering daily stressors in addition to major stressor events when examining well-being outcomes. While one may posit that the best way to tackle the issue is to minimize stressor exposure directly, the factors contributing to stressor exposure are often structural and thus beyond the individual's control (Surachman et al., 2019). Hence, there is increasing impetus for research in managing the cumulative nature of the negative impacts of daily stressors to foster better affective well-being in the long run.

In the search for ways to better one's well-being in the face of stressors, various factors have been examined as potential buffers

against affective reactivity to daily stressors. While research has found numerous external factors that serve as stress buffers against daily stressors (e.g., social support; Kirschbaum et al., 1995), identifying intrapersonal protective factors are particularly meaningful as they are less susceptible to influences beyond one's control. Currently, a number of internal factors including spirituality (Fabricatore et al., 2000), self-concept clarity (Ritchie et al., 2011), and locus of control (Lefcourt et al., 1984) have been identified as potential moderators of the relationship between stressors and affective well-being. Another promising internal factor that has been of interest to researchers is self-esteem—one's thoughts and feelings about themselves (Rosenberg, 1965).

1.1. Effect of self-esteem on emotional reactivity

Decades of research on self-esteem has revealed support for the idea that it is beneficial for one's affective well-being (e.g., Lyubomirsky et al., 2006). While some theories posit that self-esteem is directly beneficial for affective well-being, others suggest that self-esteem serves as a protective factor, buffering against the negative emotions evoked by stressors. A particularly notable theory supporting the latter point of view posits that people with high self-esteem make use of more effective

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coping strategies when faced with unfavorable situations (Schütz, 1998), thereby reducing the detrimental effects of these situations on their sense of well-being. For example, individuals high on self-esteem are more likely to discredit sources of negative feedback or recall other positive aspects of themselves to maintain a positive self-view in the face of unfavorable feedback (Blaine & Crocker, 1993; Spencer et al., 1993). The employment of such effective coping strategies may serve as a buffer against the detrimental effects of these situations on well-being (Aldao et al., 2010; Gross, 2002). Indeed, this theory has received substantial empirical support (e.g., Brown, 1993, 1998; Chapman & Mullis, 2000; Schütz, 1998), suggesting the adaptive functionality of self-esteem as a buffer in stressful or unfavorable situations.

Relatedly, Brown & Harris (1978) psychosocial model of depression also posits that self-esteem can buffer against depressive symptoms. According to the model, individuals with higher self-esteem are less likely to appraise negative life events as hopeless. Thus, they are less likely to perceive the stressor as a threat, thereby reducing the detrimental effects of stressors on their sense of well-being, and in particular, depressive symptoms (Brown & Harris, 1978). Taken together, existing theories suggest that high self-esteem might be instrumental in regulating an individuals' negative affectivity when they are faced with daily stressors.

However, the empirical literature directly examining the role of self-esteem as a buffer against daily affective reactivity arising from daily stressors is relatively scant. Indeed, research on the effects of self-esteem on day-to-day affective reactivity through a daily diary format is particularly sparse (e.g., Lee-Flynn et al., 2011). The most notable existing work examining the effect of self-esteem as a buffer against affective reactivity in the face of daily stressors is the work done by Lee-Flynn et al. (2011). Through a daily diary study, Lee-Flynn et al. (2011) found that individuals in stepfamily unions with high trait self-esteem experienced lower increases in daily negative affect in the face of daily negative cognitive appraisals about family stressors. The positive relationship between daily negative cognitive appraisals arising from familial stressors and daily negative affect were significantly weaker among those high on self-esteem compared to those low on self-esteem. Although not directly studying daily stressors, tangential work by Campbell et al. (1991) found in a similar vein that participants in a daily diary study who had high esteem had lower day-to-day affective reactivity.

Taken together, preliminary work does suggest that self-esteem may be an effective protective factor against increases in daily negative affect in the face of daily stressors. Nonetheless, the scant literature directly testing the moderating role of self-esteem in the context of daily stressors suggests the need for more work directly testing the role of self-esteem as a protective factor. Additionally, there is a need to test the current phenomenon using a broader operationalization of daily stressors (e.g., network stressors, arguments; Almeida et al., 2002), and examine this phenomenon in non-WEIRD samples (Henrich et al., 2010) for a more robust examination of the potential buffering role of self-esteem.

1.2. Aims of the current research

There are two main aims of the current study. First, the current study further aims to examine the role of trait self-esteem as a buffer against the negative effect of daily stressors on individuals' affective well-being. Second, by examining these relationships among two Singaporean samples (a collectivistic culture; Hofstede et al., 2005), and an American sample (an individualistic culture; Hofstede et al., 2005), the current work examines whether prior findings evidencing the role of self-esteem as a buffer are replicable among young and middle-aged adults across these two cultures. By tapping on large-scale daily diary data from three samples from Singapore (Study 1 and 2) and the United States (Study 3), the current work leverages on two main strengths arising from the use of a daily diary methodology (Scollon et al., 2003). The first is the ability to rule out inter-individual variations which were not fully addressed in

previous works. Secondly, by using real-life settings, theoretical concepts and empirical findings can be ecologically validated.

In line with existing work suggesting that self-esteem functions similarly across Asian and Western cultures (Brown et al., 2009), we did not hypothesize that the role of self-esteem would differ across the Singaporean and American samples. In both samples and across all three studies, we hypothesized that individuals would report higher levels of negative affect and lower levels of positive affect on stressor days relative to non-stressor days. Additionally, we hypothesized that high self-esteem would act as a buffer against the detrimental effects of daily stress on negative affect. Specifically, we predicted that trait self-esteem would moderate the relationship between daily stressor exposure and daily negative affect, where the positive association between daily negative affect and daily stressor would be weaker for those with higher self-esteem. We also hypothesized that self-esteem would remain a significant moderator in the relationship between daily stressor exposure and negative affect after controlling for demographics, perceived quality of life, and the big five personality traits. Given that much of the literature examining self-esteem as a buffer has focused mainly on negative outcomes such as negative affect and depressive symptoms, we had no specific hypotheses regarding how trait self-esteem would affect the relationship between daily stressor exposure and daily positive affect. Nonetheless, for a more holistic examination of the buffering role of self-esteem, we sought to examine whether self-esteem would moderate the relationship between daily stressors and daily positive affect as well.

2. General method

2.1. Design

Each study adopted a daily diary approach to data collection. Baseline data was collected through self-administered questionnaires in all studies, while data about participants' daily experiences was collected through online diary-format surveys over 7 consecutive days per participant (Study 1, and Study 2) or through daily telephone interviews over 8 consecutive days per participant (Study 3).² The collection of data was approved by the Institutional Review Board at the Singapore Management University (Study 1 and Study 2) or at the University of Wisconsin-Madison (Study 3). Informed consent was obtained from all participants prior to data collection. More details are provided when describing each study.

2.2. Measures

In each study, trait self-esteem, daily stressor exposure, daily positive and negative affect were assessed. In addition, demographic, quality-of-life, and personality covariates were assessed in each study. Measure reliabilities are presented when describing each study in detail.

2.2.1. Trait self-esteem

In each study, a baseline measure of trait self-esteem was obtained through a modified 7-item version of Rosenberg (1965) Self-Esteem Scale (Study 1 and Study 3) or the original 10-item version of the scale (Study 2). Participants rated the degree to which they agreed (1 = *Strongly agree*, 7 = *Strongly disagree*) with each item in the measure (e.g., "I am no better and no worse than others"). To aid comparability across the current studies, self-esteem scores were calculated by taking the average of the items in each scale, such that the lowest possible score was 1 and the highest possible score was 7 regardless of which version

² Supplementary analysis including day (weekday vs. weekend, dummy-coded with weekday as reference) and the day × daily stressor exposure interaction as covariates yielded similar findings to those reported in the main manuscript. The full summary of these analyses can be found in ResearchBox #171.

was used.

2.2.2. Daily stressor exposure

In all studies, the occurrence of daily stressors was measured using the Daily Inventory of Stressful Events (Almeida et al., 2002). This measure encapsulates seven types of stressors, namely: arguments, avoided arguments, discrimination, work/education stressors, stressors at home, network stressors, and others. Participants self-reported instances where they experienced any of the aforementioned stressors in a 24-hour period. If a participant reported the occurrence of at least one of the stressors, the day was categorized as a *stressor day*. Conversely, the lack of any daily stressor experiences in the day was subsequently categorized as a *non-stressor day*. From the data, 27.15 % (Study 1), 38.37 % (Study 2), and 40.15 % (Study 3) of days were categorized as stressor days. In order to evaluate and control for participant's overall exposure to stressors, a participant-level exposure to daily stressors variable was computed by calculating the proportion of days that were categorized as stressor days. This enabled us to observe the associations of both daily exposure and overall exposure to stressors with our outcomes.

2.2.3. Daily positive and negative affect

In all studies, positive and negative affect were measured daily as established in the Midlife Development Inventory (MIDI; Brim & Featherman, 1998). Participants reported their positive affect over the past 24 h across a 13-item scale of positive emotions (e.g., cheerful, enthusiastic). Daily positive affect was computed by averaging the 13 items. Similarly, participants reported their negative affect over the past 24 h across a 14-item scale of negative emotions (e.g., frustrated, nervous). Daily negative affect was computed by averaging the 14 items, but due to the high skewness of the negative affect scores ($skew_{Study1} = 1.80$, $skew_{Study2} = 1.67$, $skew_{Study3} = 3.13$), a square root transformation was applied to all participants' scores to minimize the impact of skewness on the assumption of normality (Ruderman & Besbeas, 1992).

2.2.4. Covariates

Education was measured on a 12-point scale (1 = *No school/some grade school*, 12 = *PhD, EdD, MD, DDS, LLB, LLD, JD, or other professional degree*) in Study 3. Educational attainment was not measured in Studies 1 and 2 given that the samples were undergraduate samples. Participants' monthly household income in SGD was measured on a 6-point scale (1 = *less than SGD2000*, 2 = *SGD2000–5999*, 3 = *SGD6000–9999*, 4 = *SGD10,000–14,999*, 5 = *SGD15,000–19,999*, 6 = *more than SGD20,000*) in Studies 1 and 2. Participants' annual personal income in USD was measured by the thousands in Study 3.

Proxies of quality of life were assessed in terms of subjective social status, subjective physical health, and/or subjective mental health were available in each study. Across all studies, subjective social status was measured on a 10-point ladder scale (1 = *Lowest status*, 10 = *Highest status*; Adler et al., 2000). Subjective physical health (Study 2 and Study 3) and subjective mental health (Study 2) were each measured on a 5-point scale (1 = *Poor*, 5 = *Excellent*).

Participants' big five personality traits (Costa & McCrae, 1992) were also measured as covariates in all three studies. In Studies 1 and 2, participants' big five personality traits (i.e., agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience) were measured using the 30-item Big Five Inventory–2-Short (Soto & John, 2017). Each facet of the big five personality traits were measured using 6 items on a 5-point scale (1 = *Disagree strongly*, 5 = *Agree strongly*). In Study 3, agreeableness (five items), conscientiousness (five items), extraversion (five items), neuroticism (four items) and openness to experience (seven items) were measured on a 4-point scale (1 = *Not at all*, 4 = *A lot*) using 26 adjectives developed specially for the MIDUS project (Lachman & Weaver, 1997). In all three studies, scores on each of the five personality traits were scored such that higher values indicated

greater endorsement of that particular trait.

2.3. Analytic approach

The design of each study involved repeated measures across multiple days for each participant; repeated observations (Level 1) over the course of 7 days (Study 1 and Study 2) or 8 days (Study 3) were nested within participants (Level 2). As such, multilevel modeling with autocorrelation was conducted to examine if trait self-esteem could serve as a moderating factor against affective reactivity towards daily stressors.

Daily negative affect and daily positive affect were considered separately as outcomes using four two-level models each. Exposure to daily stressors was dummy coded as 0 (*no stressors*) or 1 (*exposure to stressors*) at Level 1. Overall exposure to stressors, trait self-esteem, and all covariates were considered at Level 2. Continuous Level 2 variables, except for overall exposure to stressors (i.e., trait self-esteem, age, household income, quality of life indicators, and personality variables), were grand mean-centered. Binary predictors at Level 2 (i.e., race and sex) were dummy coded as 0 (*majority race* or *male* respectively) or 1 (*minority race* or *female* respectively). There was no missing data at baseline in all three studies. Hence, across all three studies, no participants were dropped during our analyses. Participants who provided less than seven (in Study 1 and Study 2) or eight (in Study 3) days of data were still included in the analyses through the multilevel modeling analyses.

To improve the rigor of our investigation, four separate analyses were conducted for each outcome, with each analysis adding additional covariates on top of the last. The first model was an unadjusted model testing the associations between trait self-esteem and affective reactivity to stressors. The second model accounted for participant demographics which included objective measures of socioeconomic status (Grzywacz et al., 2004; Protheroe et al., 2013; Stawski et al., 2008). In light of previous research showing associations between quality of life and stress reactivity (e.g., Karvinen et al., 2013), each participant's self-rating of their perceived social status, perceived physical health, and perceived mental health were added as proxies of quality of life in the third model, where available in each study. Lastly, personality variables were added in the fourth model (Soliemanifar et al., 2018). In order to establish proper statistical control in the adjusted models (Yzerbyt et al., 2004), we included not just the covariate terms, but also the interaction terms between each covariate and daily stressor exposure in order to ultimately arrive at a clearer estimate of the association between self-esteem and affective reactivity to stress. The general equations for the final model are thus as follows³:

$$\begin{aligned} \text{Level 1: (Daily affect)}_{d,i} &= B_{0,i} + B_{1,i}(\text{daily stressor exposure})_{d,i} + \epsilon_{d,i} \\ \text{Level 2: } B_{0,i} &= \gamma_{0,0} + \gamma_{0,1}(\text{average daily stressor exposure})_i + \gamma_{0,2}(\text{trait self-esteem})_i \\ &+ \gamma_{0,3-8}(\text{demographics})_i + \gamma_{0,9-11}(\text{quality of life})_i \\ &+ \gamma_{0,12-16}(\text{personality})_i + \mu_{0,i} \\ B_{1,i} &= \gamma_{1,0} + \gamma_{1,1}(\text{trait self-esteem})_i + \gamma_{1,2-7}(\text{demographics})_i \\ &+ \gamma_{1,8-10}(\text{quality of life})_i + \gamma_{1,11-15}(\text{personality})_i \\ &+ \mu_{1,i} \end{aligned}$$

At Level 1, $B_{0,i}$ (i the intercept coefficient for each participant i) indicates participant i 's average levels of positive or negative affect on non-stressor days. $B_{1,i}$ shows the change in daily affect on a stressor relative to a non-stressor day. $B_{1,i}$ thus represents participant i 's change in affect in response to stressors. At Level 2, $B_{0,i}$ represented the intercept coefficient for each participant i , and was modeled as a function of between-

³ Supplemental analyses controlling for the opposite valence affect and the interaction between the opposite-valenced affect with daily stressor yielded similar findings to those reported in the main manuscript. The full summary of these analyses can be found in ResearchBox #171.

participant differences. This includes participant i 's average stressor exposure over the duration of the 7 (Study 1 and Study 2) or 8 (Study 3) days, trait self-esteem, and other covariates. $B_{1,i}$ represents the slope coefficient for each participant i , and was modeled as a function of trait self-esteem and each of the covariates. The specific parameter of interest, $\gamma_{1,1}$, is the coefficient of the cross-level interaction between trait self-esteem and daily stressor exposure, thereby quantifying the average change in affective reactivity to daily stressors per unit increase in trait self-esteem. $\mu_{0,i}$ and $\mu_{1,i}$ indicate the deviation of each participant's intercept and slope respectively from the implied values as derived from the model.

Lastly, in order to integrate our findings across the three studies reported here, we ultimately conducted an internal random-effects meta-analysis to arrive at an aggregated estimate of the role that trait self-esteem plays as a buffer against daily stressors (i.e., $\gamma_{1,1}$). We conducted two meta-analyses, with one analysis examining positive affective reactivity, and the other examining negative affective reactivity. Both analyses were conducted from study-level estimates extracted from the final model in each study.

2.4. Transparency and openness

The current work's design and its analysis plan were not pre-registered. Data for Study 1 and Study 2 have been made publicly available on ResearchBox (#171; <https://researchbox.org/171>), while data for Study 3 is available from ICPSR (<https://www.icpsr.umich.edu/>). A full summary of the analyses on positive and negative affect for all four models for all studies are also available in the supplemental materials on ResearchBox. All analyses were conducted in R version 3.6.3 (R Core Team, 2020). Measure reliabilities were calculated in the form of Cronbach's alpha using *psych* version 2.1.6 (Revelle, 2021) and intraclass correlation coefficients were computed using *merTools* version 0.5.2 (Knowles & Frederick, 2016). Within-persons correlations were calculated using *rmcorr* version 0.4.6 (Bakdash & Marusich, 2017). Multilevel modeling and analysis were conducted using *nlme* version 3.1-155 (Pinheiro, Bates, & R Core Team, 2022) through the restricted maximum likelihood estimation method. Simple slopes analyses were conducted using *reghelper* version 1.1.1 (Hughes & Beiner, 2022). Effect sizes in the form of standardized coefficients were calculated by *effectsiz* version 0.6.0.1 (Ben-Shachar et al., 2020). Lastly, internal meta-analyses were conducted using *metafor* version 3.0-2 (Viechtbauer, 2010).

3. Study 1

3.1. Participants

Data for the current study was collected as part of a larger project examining daily experiences and cognitive functioning, conducted with a convenience sample of young adults in Singapore in December 2020 to February 2021 (Lua et al., 2022). A total of 1779 observations of daily data were obtained from 261 participants, where 98.37 % of participants provided at least five days of observations. A summary of descriptive statistics can be found in Table 1.

4. Results

4.1. Daily positive affect

We found that daily stressor exposure was associated with lower daily positive affect in all models ($\beta_s = -0.07$, $\gamma_{1,0s} = [-0.16, -0.14]$), though this observation was only statistically significant in Model 1 ($p < .001$) and not in the remaining models ($ps \geq 0.098$). The trend was such that on stressor days, participants had lower positive affect than on non-stressor days. Higher trait self-esteem was significantly associated with higher positive affect in all models ($\beta_s = [0.17, 0.35]$, $\gamma_{0,2s} = [0.16, 0.33]$, $ps < 0.010$), such that participants with higher trait self-esteem

Table 1
Descriptive statistics in Study 1.

	N	M (SD) or %	Range	α	ICC
Participant level					
Trait self-esteem	261	4.22 (0.94)	1–6.86	0.75	
Average stressor exposure	261	0.27 (0.26)	0.00–1.00		
Demographics					
Race (% Chinese)	261	85.06 %			
Sex (% female)	261	73.95 %			
Age	261	22.36 (1.72)	19–30		
Household income	261	3.05 (1.45)	1–6		
Subjective quality of life					
Subjective social status	261	6.20 (1.38)	3–9		
Personality					
Agreeableness	261	3.53 (0.65)	1.50–4.83	0.68	
Conscientiousness	261	3.18 (0.76)	1.33–4.83	0.75	
Extraversion	261	2.98 (0.80)	1.00–5.00	0.77	
Neuroticism	261	3.02 (0.85)	1.00–5.00	0.81	
Openness to experience	261	3.34 (0.68)	1.00–4.83	0.59	
Day level					
Daily positive affect	1779	1.96 (0.93)	0.00–4.00	[0.95, 0.97]	0.61
Daily negative affect	1779	0.55 (0.66)	0.00–4.00	[0.93, 0.95]	0.56
Daily negative affect (sqrt)	1779	0.59 (0.45)	0.00–2.00		0.57
Daily stressor exposure (% of days)	1779	27.15 %			0.62

Note. α = Cronbach's alpha. ICC = intraclass correlation coefficient.

generally displayed higher levels of positive affect.

Additionally, we found that the cross-level interaction between daily stressor exposure and trait self-esteem was consistently non-significant in Model 1 ($\beta = 0.02$, 95 % CI = $[-0.01, 0.06]$, $\gamma_{1,1} = 0.05$, $SE = 0.04$, $p = .210$), Model 2 ($\beta = 0.02$, 95 % CI = $[-0.02, 0.06]$, $\gamma_{1,1} = 0.05$, $SE = 0.04$, $p = .275$), Model 3 ($\beta = 0.02$, 95 % CI = $[-0.02, 0.06]$, $\gamma_{1,1} = 0.05$, $SE = 0.04$, $p = .253$), and Model 4 ($\beta = 0.02$, 95 % CI = $[-0.03, 0.07]$, $\gamma_{1,1} = 0.04$, $SE = 0.06$, $p = .457$), suggesting that trait self-esteem did not help in maintaining positive affect on stressor days compared to non-stressor days.

4.2. Daily negative affect

We found that daily stressor exposure was significantly associated with increased negative affect in all models ($\beta_s = 0.21$, $\gamma_{1,0s} = [0.19, 0.21]$, $ps < 0.001$) such that on stressor days, participants had higher negative affect than on non-stressor days. On the other hand, higher trait self-esteem was significantly associated with lower negative affect in the first three models ($\beta_s = [-0.28, -0.25]$, $\gamma_{0,2s} = [-0.12, -0.11]$, $ps < 0.001$), such that participants with higher trait self-esteem generally displayed lower levels of negative affect, but not in the final model ($\beta = -0.12$, $\gamma_{0,2} = -0.05$, $p = .115$).

We found that the two-way interaction between daily stressor exposure and trait self-esteem was consistently non-significant in Model 1 ($\beta = -0.03$, 95 % CI = $[-0.07, 0.01]$, $\gamma_{1,1} = -0.03$, $SE = 0.02$, $p = .133$), Model 2 ($\beta = -0.03$, 95 % CI = $[-0.07, 0.01]$, $\gamma_{1,1} = -0.03$, $SE = 0.02$, $p = .165$), Model 3 ($\beta = -0.03$, 95 % CI = $[-0.08, 0.01]$, $\gamma_{1,1} = -0.04$, $SE = 0.02$, $p = .126$) and Model 4 ($\beta = -0.03$, 95 % CI = $[-0.09, 0.02]$, $\gamma_{1,1} = -0.04$, $SE = 0.03$, $p = .228$), suggesting that trait self-esteem did not help participants protect against increases in negative

affect on stressor days compared to non-stressor days.

5. Study 2

Study 2 sought to improve on Study 1 in two main ways. First, we utilized the full measure of Rosenberg (1965) Self Esteem Scale, rather than the modified 7-item version used in Study 1, to improve the validity of the self-esteem measure. Second, to obtain a more holistic index of subjective quality of life, subjective mental health and subjective physical health were measured as additional covariates. Additionally, while Study 1 was conducted in the early stages of the COVID-19 pandemic, Study 2 was conducted during the height of the COVID-19 pandemic transmissions and restrictions in Singapore. Thus, we also sought to investigate the potential effects that the pandemic might have on the experience of daily stressors and emotional reactivity.

5.1. Participants

Data for the current study was collected as part of a follow-up project to that described in the previous study, conducted with a separate convenience sample of young adults in Singapore from June 2021 to August 2021. A total of 1721 observations of daily data were obtained from 253 participants, where 98.42 % of participants provided at least five days of observations. A summary of descriptive statistics can be found in Table 2.

Table 2
Descriptive statistics in Study 2.

	N	M (SD) or %	Range	α	ICC
Participant level					
Trait self-esteem	253	4.42 (0.95)	1.70–7.00	0.87	
Average stressor exposure	253	0.38 (0.30)	0.00–1.00		
Demographics					
Race (% Chinese)	253	75.10 %			
Sex (% female)	253	76.68 %			
Age	253	22.11 (1.63)	19–29		
Household income	253	3.00 (1.43)	1–6		
Subjective quality of life					
Subjective social status	253	6.11 (1.25)	2–10		
Subjective physical health	253	3.49 (0.88)	1–5		
Subjective mental health	253	3.17 (0.93)	1–5		
Personality					
Agreeableness	253	3.61 (0.59)	2.17–5.00	0.66	
Conscientiousness	253	3.30 (0.60)	1.67–5.00	0.65	
Extraversion	253	3.13 (0.73)	1.33–5.00	0.74	
Neuroticism	253	2.98 (0.79)	1.00–5.00	0.82	
Openness to experience	253	3.42 (0.65)	2.00–4.83	0.64	
Day level					
Daily positive affect	1721	1.90 (0.91)	0.00–4.00	[0.95, 0.97]	0.54
Daily negative affect	1721	0.57 (0.61)	0.00–3.93	[0.91, 0.93]	0.44
Daily negative affect (sqrt)	1721	0.63 (0.41)	0.00–1.98		0.47
Daily stressor exposure (% of days)	1721	38.12 %			0.64

Note. α = Cronbach's alpha. ICC = intraclass correlation coefficient.

6. Results

6.1. Daily positive affect

Like in Study 1, we found that daily stressor exposure was associated with lower daily positive affect in all models ($\beta = -0.12, -0.13, \gamma_{1,0S} = [-0.24, -0.11]$), although this negative association was only statistically significant in Model 1 ($p < .001$) and not in the remaining models ($ps \geq 0.215$). The trend was such that on stressor days, participants had lower positive affect than on non-stressor days. Also similar to Study 1, higher trait self-esteem was found to be significantly associated with higher positive affect in all models ($\beta = [0.21, 0.37], \gamma_{0,2S} = [0.18, 0.36], ps \leq 0.005$), such that participants with higher trait self-esteem generally displayed higher levels of positive affect.

Similarly, we found that the cross-level interaction between daily stressor exposure and trait self-esteem was consistently non-significant in Model 1 ($\beta = 0.002, 95\% \text{ CI} = [-0.04, 0.04], \gamma_{1,1} = -0.004, SE = 0.04, p = .931$), Model 2 ($\beta = -0.01, 95\% \text{ CI} = [-0.05, 0.04], \gamma_{1,1} = -0.01, SE = 0.04, p = .785$), Model 3 ($\beta = 0.01, CI = [-0.04, 0.06], \gamma_{1,1} = 0.01, SE = 0.05, 95\%, p = .811$), and Model 4 ($\beta = 0.02, 95\% \text{ CI} = [-0.04, 0.09], \gamma_{1,1} = 0.05, SE = 0.06, p = .436$) like in Study 1, suggesting that trait self-esteem did not help in maintaining positive affect on stressor days compared to non-stressor days.

6.2. Daily negative affect

Alike Study 1, we found that daily stressor exposure was significantly associated with increased negative affect in all models ($\beta = 0.27, \gamma_{1,0S} = [0.10, 0.23], ps \leq 0.04$) such that on stressor days, participants had higher negative affect than on non-stressor days. Higher trait self-esteem was significantly associated with lower negative affect in Model 1, Model 2, and Model 3 ($\beta = [-0.26, -0.17], \gamma_{0,2S} = [-0.11, -0.08], ps < 0.001$) like in Study 1, such that participants with higher trait self-esteem generally displayed lower levels of negative affect. However, similar to Study 1, trait self-esteem was not related to negative affect in the final model ($\beta = -0.07, \gamma_{0,2} = -0.04, p = .079$).

We found that the two-way interaction between daily stressor exposure and trait self-esteem was consistently non-significant in Model 1 ($\beta = 0.01, 95\% \text{ CI} = [-0.05, 0.04], \gamma_{1,1} = 0.006, SE = 0.02, p = .763$), Model 2 ($\beta = 0.01, \gamma_{1,1} = 0.01, SE = 0.02, 95\% \text{ CI} = [-0.04, 0.05], p = .754$), Model 3 ($\beta = 0.03, 95\% \text{ CI} = [-0.02, 0.09], \gamma_{1,1} = 0.03, SE = 0.02, p = .209$) and Model 4 ($\beta = 0.04, \gamma_{1,1} = 0.03, SE = 0.03, 95\% \text{ CI} = [-0.03, 0.1], p = .259$), suggesting that trait self-esteem did not help participants protect against increases in negative affect on stressor days compared to non-stressor days. These results were consistent with our findings in Study 1.

7. Study 3

To examine whether our findings from Study 1 and Study 2 were replicable in a Western context, we attempted to replicate our findings using daily diary data from the MIDUS projects. Additionally, Study 3 included middle aged adults on top of young adults. Considering that adult samples may have more daily stressors than a student sample (e.g., greater concerns about family planning, job security etc.), Study 3 was able to utilize a sample with greater occurrences of daily stressors (40.15 %) compared to Study 1 (27.15 %) and Study 2 (38.37 %).

7.1. Participants

Data for the current study was obtained from two waves of the MIDUS projects, namely the MIDUS 2 (Ryff et al., 2007) and MIDUS Refresher 1 (Ryff et al., 2016) projects, which each consisted of a nationally-representative probability sample of American adults and was conducted between 2004 and 2006, and 2011 and 2014 respectively. A subset of participants from the MIDUS 2 and MIDUS Refresher 1

waves participated in the National Study of Daily Experiences sub-projects of each wave (Ryff & Almeida, 2009, 2018), which tracked participants' physical and emotional reactivity to daily stressors via telephone interviews over eight consecutive days. The subset of participants who completed both the baseline self-administered written survey and telephone interviews were included in the study. The current study thus utilized data from 2336 participants (55.61 % female), aged between 25 and 84 years ($M = 53.64$, $SD = 12.91$). A total of 17,383 observations of daily data were obtained from the 2336 participants ($M = 7.44$ days per participant). A summary of the descriptive statistics of the sample analyzed in the study can be found in Table 3.

8. Results

8.1. Daily positive affect

In line with our findings in Study 1 and Study 2, we found that daily stressor exposure was associated with lower daily positive affect in all models ($\beta_s = -0.08$, $\gamma_{1,0s} = [-0.14, -0.11]$, $ps < 0.001$) such that on stressor days, participants had lower positive affect than on non-stressor days. These associations were statistically significant for all models, contrary to Study 1 and Study 2 whereby the association was only significant in Model 1. On the other hand, in line with Study 1 and Study 2, higher trait self-esteem was significantly associated with higher positive affect in all models ($\beta_s = [0.16, 0.36]$, $\gamma_{0,2s} = [0.12, 0.27]$, $ps < 0.001$),

Table 3
Descriptive statistics in Study 3.

	N	M (SD) or %	Range	α	ICC
Participant level					
Trait self-esteem	2336	5.39 (1.05)	1–7	0.76	
Average stressor exposure	2336	0.41 (0.27)	0.00–1.00		
Demographics					
Marital status (% married)	2336	70.68 %			
Race (% White)	2336	92.36 %			
Sex (% female)	2336	55.61 %			
Age	2336	53.64 (12.91)	25–84		
Education	2336	7.64 (2.49)	1–12		
Personal income (in thousands)	2336	43.52 (40.61)	0–200		
Subjective quality of life					
Subjective social status	2336	6.41 (1.85)	1–10		
Subjective physical health	2336	2.38 (1.01)	1–5		
Personality					
Agreeableness	2336	3.42 (0.51)	1.20–4.00	0.80	
Conscientiousness	2336	3.38 (0.46)	1.00–4.00	0.69	
Extraversion	2336	3.10 (0.58)	1.20–4.00	0.77	
Neuroticism	2336	2.06 (0.65)	1.00–4.00	0.75	
Openness to experience	2336	2.92 (0.53)	1.00–4.00	0.76	
Day level					
Daily positive affect	17,383	2.67 (0.80)	0.00–4.00	[0.93, 0.95]	0.77
Daily negative affect	17,382	0.19 (0.31)	0.00–3.43	[0.82, 0.86]	0.52
Daily negative affect (sqrt)	17,382	0.30 (0.32)	0.00–1.85		0.47
Daily stressor exposure (% of days)	17,383	40.15 %			0.48

Note. α = Cronbach's alpha. ICC = intraclass correlation coefficient.

such that participants with higher trait self-esteem generally displayed higher levels of positive affect.

We found that the cross-level interaction between daily stressor exposure and trait self-esteem was consistently non-significant in Model 1 ($\beta = 0.01$, 95 % CI = $[-0.004, 0.01]$, $\gamma_{1,1} = 0.01$, $SE = 0.01$, $p = .267$), Model 2 ($\beta = 0.003$, 95 % CI = $[-0.01, 0.01]$, $\gamma_{1,1} = 0.01$, $SE = 0.01$, $p = .487$), Model 3 ($\beta = -0.004$, 95 % CI = $[-0.01, 0.01]$, $\gamma_{1,1} = -0.01$, $SE = 0.01$, $p = .503$), and Model 4 ($\beta = -0.004$, 95 % CI = $[-0.02, 0.01]$, $\gamma_{1,1} = -0.01$, $SE = 0.01$, $p = .547$), suggesting that trait self-esteem did not help in maintaining positive affect on stressor days compared to non-stressor days. These results were consistent with Study 1 and Study 2.

8.2. Daily negative affect

Similar to the findings in Study 1 and Study 2, we intuitively found that daily stressor exposure was significantly associated with increased negative affect in all models ($\beta_s = [0.30, 0.31]$, $\gamma_{1,0s} = [0.19, 0.20]$, $ps < 0.001$) such that on stressor days, participants had higher negative affect than on non-stressor days. On the other hand, similar to Study 1 and Study 2, higher trait self-esteem was significantly associated with lower negative affect in the first three models ($\beta_s = [-0.24, -0.20]$, $\gamma_{0,2s} = [-0.07, -0.06]$, $ps < 0.001$), such that participants with higher trait self-esteem generally displayed lower levels of negative affect. Contrary to Study 1 and Study 2, higher trait self-esteem remained significantly associated with lower negative affect in the final model ($\beta = -0.11$, $\gamma_{0,2} = -0.04$, $p < .001$), controlling for personality variables.

Contrary to our finding in our previous two studies, we found that the two-way interaction between daily stressor exposure and trait self-esteem was significant in the unadjusted Model 1 ($\beta = -0.02$, 95 % CI = $[-0.04, -0.01]$, $\gamma_{1,1} = -0.01$, $SE = 0.004$, $p < .001$; Fig. 1) and after controlling for demographic characteristics in Model 2 ($\beta = -0.02$, 95 % CI = $[-0.03, -0.004]$, $\gamma_{1,1} = -0.01$, $SE = 0.004$, $p = .011$; Fig. 1). The patterns were such that participants low in trait self-esteem tended to show larger increases in negative affect on stressor days, while participants high in trait self-esteem tended to show smaller increases as depicted in Fig. 1. However, the interaction became non-significant after controlling for proxies of quality of life in Model 3 ($\beta = -0.01$, 95 % CI = $[-0.03, 0.02]$, $\gamma_{1,1} = -0.01$, $SE = 0.005$, $p = .184$) and personality traits in Model 4 ($\beta = 0.003$, 95 % CI = $[-0.02, 0.02]$, $\gamma_{1,1} = 0.002$, $SE = 0.01$, $p = .779$), suggesting that trait self-esteem did not help participants buffer against increases in negative affect on stressor days compared to non-stressor days.

9. Internal meta-analysis

Lastly, we aggregated our findings across all 2850 individuals from the three studies through an internal meta-analysis. Specifically, we conducted two separate random-effects meta-analyses on the cross-level interaction between trait self-esteem and daily stressor exposure, with one using daily positive affect as the outcome of interest, and the other using daily negative affect as the outcome of interest (see Fig. 2). We found that for daily positive affect, the meta-analytic estimate of $\gamma_{1,1}$ was -0.001 ($SE = 0.01$, 95 % CI = $[-0.01, 0.01]$, $z = -0.14$, $p = .892$). For daily negative affect, the meta-analytic estimate of $\gamma_{1,1}$ was 0.002 ($SE = 0.01$, 95 % CI = $[-0.02, 0.02]$, $z = 0.19$, $p = .851$). These results suggest that the cross-level interaction between trait self-esteem and daily stressor exposure on both positive and negative affect reactivity were not significant.

10. Discussion

Our study examines the role of self-esteem as a buffer against the negative effect of daily stressors on individuals' affective well-being and its replicability among young and middle-aged adults across Singaporean and American samples. All studies utilized a daily diary approach to data collection with trait self-esteem measured at baseline, while

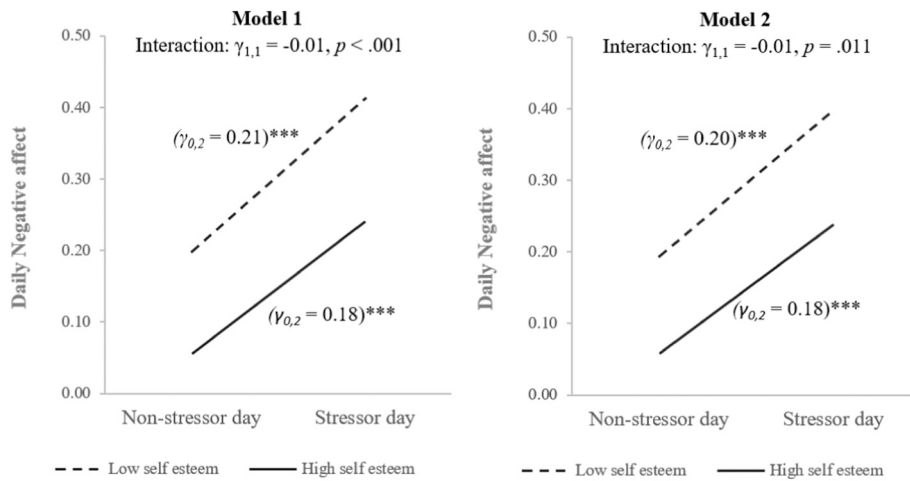


Fig. 1. Simple slopes for negative affect in Model 1 (left) and Model 2 (right). Note. The graphs present the simple slope of negative affect regressed against daily stressor exposure and trait self-esteem in Model 1 (left) and Model 2 (right).

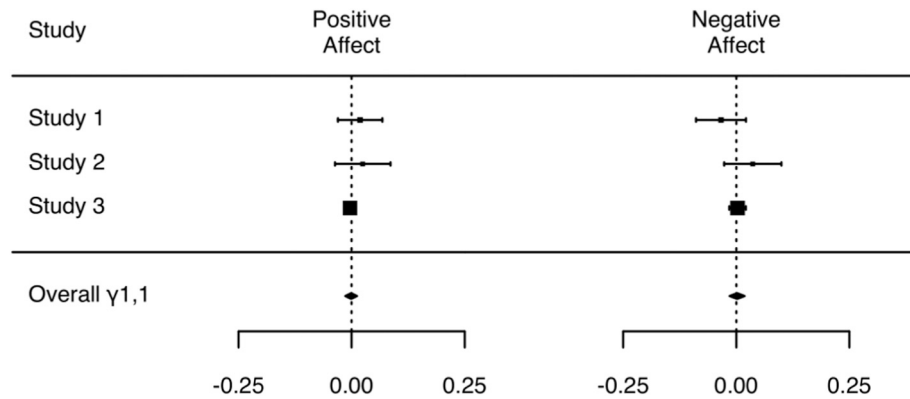


Fig. 2. Forest plot depicting internal meta-analytic estimates. Note. The black squares show the effect size and sample size (with the size of the box corresponding to sample and effect sizes) in each study. The whiskers in the figure indicate the 95 % confidence interval. The diamond reflects the pooled effect size and the width of the 95 % confidence interval.

stressor exposure and affective reactivity were measured daily. We found consistent evidence across all three studies that exposure to daily stressors was associated with poorer daily affective well-being, as indicated by lower levels of positive affect, and higher levels of negative affect. These findings are consistent with existing trends in the current literature (e.g., Polk et al., 2020; Sin et al., 2015) and support the notion that exposure to daily stressors could have effects on broader well-being in general.

Most importantly, we found in all three studies that trait self-esteem did not moderate the relationship between daily stressor exposure and daily positive affect. We also found that, contrary to our hypothesis, trait self-esteem was not a significant moderator in the relationship between daily stressor exposure and daily negative affect after controlling for covariates. Although we found significant buffering effects of self-esteem on daily stressors and negative affect in Study 3, this significant finding should be interpreted with caution. The sample size of Study 3 was large ($n = 2336$ participants). As such, a significant interaction effect observed was somewhat unsurprising. However, the effect size of the interaction between self-esteem and daily stressors was very small ($|\beta|s \leq 0.02$), suggesting that the significant effect found may not be practically significant. Additionally, the interaction effect of self-esteem became non-significant after controlling for measures of quality of life. This suggests that the ‘effect’ of self-esteem observed in Models 1 and 2 are likely attributed to differences in a combination of socio-demographic factors and quality of life rather than differences in

levels of self-esteem. Taken together, researchers seeking to study this phenomenon in future studies should consider the effects of quality of life in their analysis.

Supporting these conclusions, our internal meta-analysis aggregating the effects of all three studies cross-level interaction between trait self-esteem and daily stressor exposure on both positive and negative affect reactivity were not significant, highlighting the complex and interconnected relations between trait self-esteem and other quality of life covariates. Our null findings with respect to the role of self-esteem in the relationship between daily stressor exposure and daily negative affect is not in line with the existing literature surrounding the stress-buffering role of self-esteem.

The contributions of our findings to the literature are twofold; firstly, our results cast doubts on the purported role of self-esteem as a protective factor (e.g., Baumeister, 1982; Brown & Harris, 1978; Schütz, 1998). Contrary to our expectation and to previous studies, trait self-esteem was not observed to buffer the association between daily stressors and negative affect in our first two studies. Trait self-esteem also was not observed to buffer the association between daily stressors and negative affect in our third study after controlling for proxies of quality of life and personality traits. It may be possible that differences in methodology could explain why the current findings are not in line with existing work (e.g., Lee-Flynn et al., 2011). For example, while previous studies examined specific types of stressors (e.g., family stressors; Lee-Flynn et al., 2011), the current study examined a wide

variety of minor daily stressors that are both inter- and intrapersonal in nature. It could be possible that self-esteem may only serve to buffer against affective reactivity arising from specific types of stressors. Indeed, considering the sociometer theory of self-esteem (Leary, 2012), it may be possible that self-esteem can only buffer against affective reactivity arising from interpersonal, but not intrapersonal, stressors. However, the current work is unable to test this hypothesis given the nature of the measure used to capture the presence of daily stressors. While it is beyond the scope of this study to test this hypothesis, the current work provides some evidence suggesting that the relationship between dispositional self-esteem, daily stressors and daily affective reactivity may be more nuanced than expected.

Second, the findings of all three studies from two different countries (Singapore and the United States) taken together show that there were no significant cross-cultural differences between individualistic and collectivistic cultures on the effects of daily stressors on well-being and the role of self-esteem as a protective factor for affective reactivity.

The current study is not without caveats. Firstly, data for Studies 1 and 2 were collected during the COVID-19 pandemic. It may be possible that this context may have affected the moderating effect of self-esteem in the relationship between daily stressors and affective well-being. For example, participants may feel that the stressors arising during a pandemic situation fall less within their realm of control. As such, a high self-esteem may not buffer against the perceived threat that arise from stressors which occur in a pandemic situation, contrary to the predictions of the psychosocial model of depression (Brown & Harris, 1978). Relatedly, it is not possible to tease apart the effects of culture from the effects of the pandemic situation when comparing the Singaporean (Study 1 and 2) and American (Study 3) samples given that Study 3 was conducted outside of the COVID-19 pandemic. Differences in methodology in the studies (e.g., the use of an online daily survey in Study 1 and 2 versus the use of a daily telephone survey in Study 3) also hinder the current work's ability to identify cultural differences in the phenomenon being studied. Future work would benefit from replicating the current findings in cross-cultural samples outside of a pandemic situation and with greater consistency in methodology to facilitate a better comparison of this phenomenon.

Next, the correlational nature of the study does not allow us to conclude the directionality of our findings. It could be possible that low positive affect or high negative affect might result in higher experiences of stressors. While our statistical analyses have controlled for numerous covariates, possible unexpected confounds which may affect the relations between self-esteem and affective reactivity. To address these limitations, researchers should consider utilizing experimental designs to rule out extraneous variables and establish causal links between self-esteem and affective reactivity to stressors.

Nonetheless, the rigorous analytic method, use of daily diary design, and examination of hypotheses across two culturally distinct samples are significant strengths of the current study. Our null findings with respect to the role of trait self-esteem in the relationship between daily stressor exposure and daily negative affect contrasts with the previous literature surrounding the stress-buffering role of self-esteem. It may be possible that daily fluctuations in self-esteem, rather than trait self-esteem, buffers against the affective reactivity induced by daily stressors. However, the current work is limited in its ability to examine this possibility. Future work should seek to reconcile the current findings with the existing literature, and examine if daily fluctuations in self-esteem (rather than trait levels of self-esteem) may show greater potential in buffering against the negative affective outcomes of daily stressors.

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CRedit authorship contribution statement

Matthew H.S. Ng: Conceptualization, Writing – original draft, Writing – review & editing. **Verity Y.Q. Lua:** Conceptualization, Writing – original draft, Writing – review & editing, Formal analysis, Methodology. **Nadyanna M. Majeed:** Conceptualization, Writing – original draft, Writing – review & editing, Formal analysis, Methodology. **Andree Hartanto:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing.

Data availability

Data and codes are available on ResearchBox

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