Journal of Research in Personality 93 (2021) 104105

Contents lists available at ScienceDirect

Journal of Research in Personality

journal homepage: www.elsevier.com/locate/jrp

Dispositional optimism as a buffer against emotional reactivity to daily stressors: A daily diary approach

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ARTICLE INFO

Article history:
Received 5 January 2021
Revised 12 May 2021
Accepted 21 May 2021
Available online 27 May 2021

Keywords:
Optimism
Stress
Emotion
Longitudinal

ABSTRACT

The current research examined if dispositional optimism buffers against the negative influences of daily stressors on affective experiences, using a daily diary study of two large and nationally-drawn samples of American adults (N = 2,349). Optimism, exposure to daily stressors, and daily positive and negative affect were assessed over eight days. Multilevel modelling revealed that optimism significantly attenuated the associations between daily stressor exposure and negative affect reactivity even after controlling for demographic factors, subjective physical health, and socioeconomic status. However, in a similar analysis, the inclusion of socioeconomic variables fully accounted for the moderating effect of optimism on stress and positive affect reactivity. The findings suggest distinct processes that are involved in how optimism reduces daily stress reactivity.

1. Introduction

Daily stressors are minor hassles that occur in daily life, such as arguments with one's child or long daily commutes that have acute and cumulative impacts on physical health and psychological well-being (Almeida, Wethington, & Kessler, 2002). Some evidence suggests that optimism—the extent to which an individual holds generalized expectations for his or her future that are favorable (Scheier, Carver, & Bridges, 1994)—is an effective psychological buffer against reactivity to daily stressors. One reason is that optimistic individuals are more likely to make positive appraisals, such as believing that their problems will be resolved, which attenuate the impact of stressors (Banerjee, 2012).

Nonetheless, existing investigations of optimism as a daily or acute stress-buffer have relied on underpowered volunteer or convenient student samples (e.g., Baumgardner, 1990; Boland & Cappeliez, 1997), so the robustness and generalizability of these findings to broader populations cannot be ascertained. The investigations also often relied on cross-sectional designs that capture stress reactivity at one time point, ignoring within-person fluctuations in daily exposure to stressors and emotional states.

This research sought to address the limitations of past studies by leveraging on two large-scale daily diary samples from the Midlife in the United States (MIDUS) studies.[1] This data allows us to examine day-to-day within-person fluctuations in stress reactivity in a well-powered and nationally-drawn US adult sample, while controlling for several demographic factors and individual differences linked to daily stress and optimism. We focused on positive and negative emotional reactivity as stress responses that have been reliably linked to physical and mental health outcomes. Following past studies, we tested the prediction that individuals high in dispositional optimism would experience less positive and negative affect reactivity to daily stressors compared to individuals low in dispositional optimism.

2. Method

The current research utilized data from two waves: MIDUS 2 and MIDUS Refresher (Ryff et al., 2007; 2016). The specific day-level variables and data relevant to the current investigation were taken from the National Study of Daily Experiences (NSDE) subprojects (Ryff & Almeida, 2018; 2009) of each wave. The purpose of the NSDE was to investigate how various psychosocial factors relate to exposure to day-to-day life stressors and stress responses. Participants completed telephone interviews about their daily experiences over eight days.

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[1] Disclosures: The reported study was not pre-registered. Publicly available data from the MIDUS study was used for this research. Since 1995, the MIDUS study has been funded by the following: John D. and Catherine T. MacArthur Foundation Research Network; National Institute on Aging (P01-AG020166); National institute on Aging (U19-AG051426). The funders had no role in the analysis and interpretation of the data, writing of the report, and decision to submit the article for publication.

https://doi.org/10.1016/j.jrp.2021.104105
0092-6566/

2.1. Participants

A subset (N = 1,775) of the original 7,108 MIDUS 1 respondents returned the baseline self-administered questionnaire and participated in the MIDUS 2: NSDE, which was conducted from 2004 to 2009. In addition, a separate sub-sample (N = 781) of the original 3,577 MIDUS Refresher respondents returned the baseline self-administered questionnaire and participated in the MIDUS Refresher: NSDE from 2011 to 2014. Both the MIDUS 1 and MIDUS Refresher studies recruited non-institutionalized English-speaking adults through random digit sampling across the United States.

Given the consistent data collection methodology, both datasets were combined to strengthen the power of the analyses. Participants were only retained in the current analyses if they had no missing data at baseline. This resulted in an overall sample of 2,349 participants (female = 1,301) ranging in age from 25 to 84 years (M = 53.69, SD = 12.94), of which 92.25% identified as white and 70.58% were currently married. Daily responses were retained only if stressor exposure and positive and/or negative affect were reported. By these criteria, most participants (93.66%) completed at least six interview days. In total, the dataset comprised 17,485 completed interviews out of a possible 18,792 (N = 2,349 per day, over 8 days), yielding a completion rate of 93.04%. Data collection was approved by the Health Sciences IRBs at the University of Wisconsin-Madison and all participants provided written consent prior to participation.

Since the current research utilized secondary data, *a priori* power could not be determined. The sizes of the daily-stress buffering effects of optimism, reflected by the optimism × daily hassle interaction in past cross-sectional studies (Banerjee, 2012; Lai, 2009), were small, β = [−0.18, −0.17] (N = 94–354). As effect sizes from psychological research using small samples tend to be overestimated (Funder & Ozer, 2019), the expected interaction effect size is likely to be smaller in this much larger MIDUS sample. Additionally, a sensitivity analysis was conducted using Mplus (Muthén & Muthén, 2012) following the method recommended by Bolger, Stadler, and Laurenceau (2012) to ascertain power for multilevel designs. Given 80% power, alpha level at 0.05, and the current study's sample size of N = 2,349 participants and a maximum of N = 18,792 completed daily interviews, the smallest estimated effect that could be detected was −0.0024 for negative affect and 0.0041 for positive affect. By computing the ratio of the coefficient to its standard error (Snijders, 2005), these estimates are equivalent to a standard effect size of −2.67 for negative affect and 2.73 for positive affect that could be detected in this study.

2.2. Measures

Variables in this study were divided into day-level and participant-level data. Day-level data were measured during the eight consecutive daily interviews of the NDSE, while participant-level data were obtained through baseline surveys before the NDSE. A detailed summary of descriptive statistics, as well as zero-order correlations, can be found in the Supplemental Online Materials.

2.2.1. Day-level variables

Daily affect. Daily negative and positive affect were measured using the positive and negative affect scales from the Midlife Development Inventory (Brim & Featherman, 1998). Participants were asked to rate how often they felt 14 negative emotions (e.g., nervous, frustrated) and 13 positive emotions (e.g., cheerful, confident), in the past 24 h on a 5-point scale (0 = *none of the time*, 4 = *all of the time*). Daily negative affect was calculated by averaging the 14 items. Due to skewness of the negative affect scores, square root transformation was applied to all participants' scores to reduce skewness (M = 0.30, SD = 0.32, $\alpha_{\text{eight-days}}$ = [0.82, 0.86]). Daily positive affect was calculated by averaging the 13 items (M = 2.67, SD = 0.80, $\alpha_{\text{eight-days}}$ = [0.93, 0.95]).

Daily exposure to stressors. The presence of daily stressors was measured using the Daily Inventory of Stressful Events (Almeida et al., 2002). The inventory includes seven types of stressors: arguments, avoided arguments, discrimination, work/education stressors, home stressors, network stressors, and others. Participants were asked if any of the seven types of stressors occurred to them in the past 24 h. Following past works (e.g., Rush, Rast, Almeida, & Hofer, 2019), if at least one stressor was experienced, the day was categorized as a *stressor day*. Otherwise, it was categorized as a *non-stressor day*. Overall, 40.15% of days were categorized as stressor days. To assess and control for participants' overall exposure to stressors, a participant-level variable was created by calculating the proportion of days which were stressor days (M = 0.41, SD = 0.27). This allowed us to observe the effect of daily stressors above and beyond participants' baseline exposure to stressors.

2.2.2. Participant-Level variables

Dispositional optimism. At baseline, participants completed the Life Orientation Test (Scheier, Carver, & Bridges, 1994). Participants rated how much they agreed (1 = *a lot agree*, 5 = *a lot disagree*) with six statements (e.g., "In uncertain times, I usually expect the best"). The total score for dispositional optimism was constructed by calculating the sum of the values of the six items (M = 23.29, SD = 4.86, α = 0.82). The lowest possible score of 6 reflected lowest optimism and the highest possible score of 30 reflected highest optimism.

Covariates. Demographics, health status, and personality variables with links to affect and stress exposure, were included as covariates. The demographic variables included were age, sex, race, marital status, and three measures of socioeconomic status: education attainment (1 = *No school/some grade school*, 12 = *PhD, EdD, MD, DDS, LLB, LLD, JD, or other professional degree*; M = 7.63, SD = 2.49), personal income (M = 43,305, SD = 40,364), and the MacArthur Scale of Subjective Status (1 = *lowest status*, 10 = *highest status*; M = 6.41, SD = 1.85). Health status was assessed by a single-item subjective self-rating of physical health (1 = *excellent*, 5 = *poor*, M = 2.39, SD = 1.01).

2.3. Plan of analysis

To account for the nested data structure, multilevel modelling was conducted to examine the effect of dispositional optimism on the relationship between daily exposure to stressors and daily affect, whereby repeated measures across the 8 days (Level 1) were nested within participants (Level 2). Two-level models were run separately for daily negative affect and daily positive affect as outcomes. The presence of any daily stressors (yes/no) was entered as a random coefficient at Level 1, while each participant's dispositional optimism and average exposure to stressors were included as Level 2 predictors. To evaluate dispositional optimism as a potential moderator of the relationship between daily stressor exposure and daily affect, a cross-level interaction for daily stressor exposure × dispositional optimism was included in the models. All non-binary variables measured at Level 2 were grand mean centered.

We conducted three separate analyses for each outcome, each with an additional set of covariates, to ensure the robustness of the hypothesized interaction effect. The first model tested the effects of optimism on emotional reactivity to stressors without covariates. Demographic variables and physical health were added in the second model. Measures of objective and subjective socioeconomic status were added in the third model. As a stronger test of

the unique stress-buffering effect of dispositional optimism, cross-level interaction terms between daily stressor exposure and each covariate were included in each model to control for the moderating effects of each covariate on emotional reactivity to stressors. The equations for the final model are as follows:

$$\begin{aligned}
\text{Level 1:}\quad & (\text{Daily affect})_{di} = B_{0i} + B_{1i}(\text{daily stressor exposure})_{di} + \varepsilon_{di} \\
\text{Level 2:}\quad & B_{0i} = \gamma_{00} + \gamma_{01}(\text{average daily stressor exposure})_i \\
& \quad + \gamma_{02}(\text{dispositional optimism})_i \\
& \quad + \gamma_{03-10}(\text{covariates})_i + \mu_{0i} \\
& B_{1i} = \gamma_{10} + \gamma_{11}(\text{dispositional optimism})_i \\
& \quad + \gamma_{12-9}(\text{covariates})_i + \mu_{1i}
\end{aligned}$$

In the Level 1 equation, B_{0i} is the intercept indicating participant *i*'s average level of positive or negative affect on non-stressor days, and B_{1i} is the change in affect from a non-stressor day to a stressor day, indicating participant *i*'s emotional reactivity to stressors. At Level 2, the intercept coefficient B_{0i} for each participant *i* was modelled as a function of between-person differences, in terms of participant *i*'s average exposure to daily stressors over the 8 days, dispositional optimism, and the covariates. The slope coefficient B_{1i} for each participant *i* was modelled as a function of dispositional optimism, as well as each of the covariates, to test if each participant's reactivity slope varied by their dispositional optimism beyond the effects of the covariates. A specific parameter of interest is γ_{11} which indicates the average change in reactivity to daily stressors per unit increase in dispositional optimism (i.e., the cross-level interaction effect). The deviation of each individual's intercept and slope from the model-implied values are indicated by μ_{0i} and μ_{1i}.

Analyses were conducted in R version 3.6.3 (R Core Team. (2020), 2020) using lme4 version 1.1–23 (Bates, Mächler, Bolker, & Walker, 2015) with Nelder-Mead parameter optimization and a maximum of 10,000,000 evaluations to prevent convergence failures. Models were fitted by maximum log-likelihood to allow comparison between models which varied in their fixed effects. Significance testing was carried out using lmerTest 3.1–2 (Kuznetsova, Brockhoff, & Christensen, 2017).[2] Full summaries of the results of our multilevel models on daily negative and positive affect are available in the Supplemental Online Materials.

3. Results

3.1. Daily negative affect

We found a significant main effect of dispositional optimism on daily negative affect in Model 1 (γ_{02} = -0.012, *SE* = 0.001, 95% CI = [-0.014, −0.011], p < .001), such that higher dispositional optimism was linked to lower daily negative affect. This effect remained even after additionally controlling for age, sex, race, marital status, and self-rated physical health in Model 2 (γ_{02} = −0.009, *SE* = 0.001, 95% CI = [−0.011, −0.008], p < .001), and socioeconomic factors in Model 3 (γ_{02} = −0.009, *SE* = 0.001, 95% CI = [−0.011, −0.007], p < .001). As expected, the presence of any daily stressor was linked to increased same-day negative affect across all our models (γ_{10}'s ≥ 0.196, p's < .001).

We also found a significant cross-level interaction between dispositional optimism and daily stressor exposure on same-day negative affect in Model 1 (γ_{11} = −0.004, *SE* = 0.001, 95% CI = [−0.006, −0.002], p < .001), Model 2 (γ_{11} = −0.003, *SE* = 0.001, 95% CI = [−0.005, −0.001], p = .004), and Model 3 (γ_{11} = −0.002, *SE* = 0.001, 95% CI = [−0.00422, −0.00002], p = .047). On stressor days, participants lower in optimism (1 *SD* below the mean) reported larger increases in negative affect (*b* = 0.21, *SE* = 0.01, 95% CI = [0.20, 0.23], p < .001), compared to those with higher optimism (1 *SD* above the mean; *b* = 0.19, *SE* = 0.01, 95% CI = [0.18, 0.21], p < .001). The patterns after controlling for all covariates are depicted in Fig. 1.

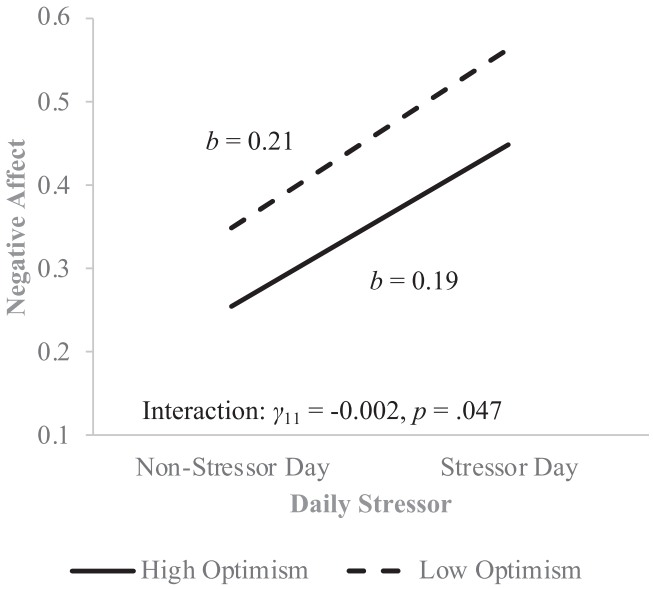

Fig. 1. Simple Slopes Depicting Cross-level Interaction on Negative Affect. Note. Slopes depict the patterns after controlling for demographics, health, and socioeconomic status.

3.2. Daily positive affect

We found a significant main effect of dispositional optimism on daily positive affect in Model 1 (γ_{02} = 0.051, *SE* = 0.003, 95% CI = [0.045, 0.057], p < .001), such that higher dispositional optimism was linked to higher daily positive affect. This effect was consistent even after additionally controlling for age, sex, race, marital status, and self-rated physical health in Model 2 (γ_{02} = 0.040, *SE* = 0.003, 95% CI = [0.034, 0.046], p < .001), and socioeconomic status in Model 3 (γ_{02} = 0.036, *SE* = 0.003, 95% CI = [0.030, 0.042], p < .001). In contrast, the presence of any daily stressor was linked to decreased same-day positive affect across all our models (γ_{10}'s ≤ -0.112, p's < .001).

The cross-level interaction between dispositional optimism and daily stressor exposure on same-day positive affect was significant in Model 1 (γ_{11} = 0.004, *SE* = 0.002, 95% CI = [0.001, 0.007], p = .021), such that on stressor days, participants lower in optimism (1 *SD* below the mean) reported larger decreases in positive affect (*b* = −0.16, *SE* = 0.01, 95% CI = [−0.18, −0.14], p < .001), compared to those with higher optimism (1 *SD* above the mean; *b* = −0.12, *SE* = 0.01, 95% CI = [−0.14, −0.10], p < .001). In contrast to our findings on negative affect, dispositional optimism no longer buffered against decreases in positive affect on stressor days after controlling for demographics and health in Model 2 (γ_{11} = 0.003, *SE* = 0.002, 95% CI = [−0.0001, 0.0066], p = .059) and socioeconomic factors in Model 3 (γ_{11} = 0.002, *SE* = 0.002, 95% CI = [-0.001, 0.006], p = .246). The patterns after controlling for all covariates are depicted in Fig. 2.

[2] The downloadable R code used for all of the reported analyses are available at: https://researchbox.org/148

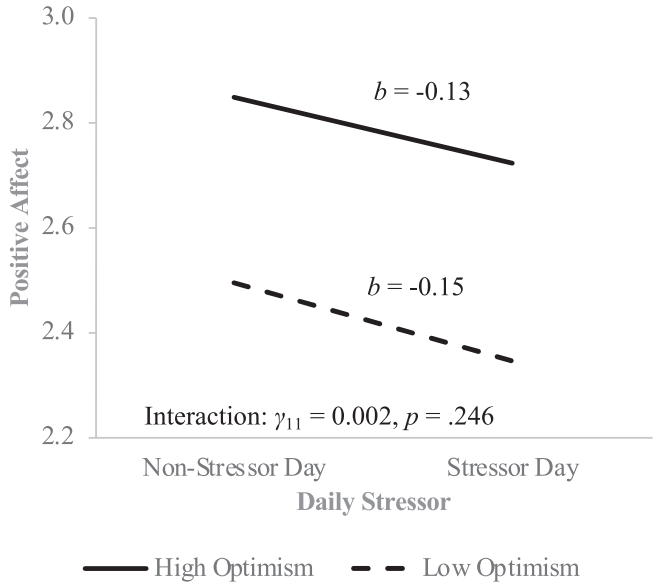

Fig. 2. *Simple Slopes Depicting Cross-level Interaction on Positive Affect. Note.* Slopes depict the patterns after controlling for demographics, health, and socioeconomic status.

4. Discussion

In this daily diary study, we found that dispositional optimism buffered participants against both positive and negative emotional reactivity before accounting for covariates. Specifically, participants with higher levels of dispositional optimism displayed smaller changes in positive and negative affect in response to daily stressors than their less optimistic counterparts. When demographic, health, and socioeconomic factors were controlled for, the buffering effect of optimism against negative emotional reactivity remained, whereas the buffering effect of optimism on positive emotional reactivity was no longer significant. In other words, positive emotional reactivity to daily stressors was fully accounted for by demographics, health, and socioeconomic status, while negative emotional reactivity to daily stressors remains uniquely explained by dispositional optimism.

The present research is the first to distinguish stress-buffering effects of optimism on positive and negative affect reactivity to daily stressors. One possible reason for the observed difference in effects is that feelings of negative affect were more responsive to daily stressors than were positive affect, which in this data appears to be accounted for by more stable demographic, health, and socioeconomic factors. As such, the ability to reappraise events by high optimists directly reduced negative affect reactivity induced by daily stressors, but was less beneficial for reducing positive affect reactivity. Another possibility is that the key psychological process through which optimism buffers against stress reactivity is through dampening negative affect rather than maintaining positive affect in response to daily stressors. For instance, high optimists may tend to engage in reappraisals that primarily reduce the negative content of the stressors (e.g., reframing the event as not as bad) rather than maintain or increase the positive content (e.g., finding something good or beneficial from the stressor). This explanation could be tested in a future study that asks individuals varying in levels of optimism to reappraise acute stressors in writing and then examining differences in their reappraisal content.

The current study has four main limitations. First, cultures differ in the meaning of positive and negative affect for their well-being (Wirtz, Chiu, Diener, & Oishi, 2009). Therefore, whether the differences in the stress-buffering effects of optimism on positive and negative emotional reactivity on this Western and predominantly White sample are generalizable to non-Western and non-White samples is unclear. Second, the correlational nature of the study limits inferences that can be drawn about the causal relationship between optimism and emotional reactivity. Instead of optimism buffering against stress, it is possible that being less reactive to stress increases optimism. As the current dataset did not assess optimism daily, this reverse causality could not be ruled out. Future research could investigate the possible bidirectional relationships using a similar daily diary study that includes daily assessments of optimism. Third, as the current study investigates mostly social stressors, the effects of non-social (e.g., physical) stressors may not be completely captured. Finally, sensitivity analyses revealed that the current study was well-powered to detect the dispositional optimism × daily stressor exposure interaction for negative affect, but not for positive affect. Therefore, further investigations with a larger sample may be needed to ascertain the relationships between optimism, daily stressors and positive affect.

Despite the limitations, the current study used a large-scale daily diary experience sampling method to address issues in past studies of optimism as a daily stress-buffer. Most importantly, the current findings highlighted the distinct stress-buffering effects of optimism on the positive compared to negative aspects of emotional reactivity. Specifically, optimism appears to have more targeted effects on negative affect in reducing daily stress reactivity, which may be the key process that improves overall health and psychological well-being in the long-run.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2021.104105.

References

Almeida, D. M., Wethington, E., & Kessler, R. C. (2002). The Daily Inventory of Stressful Events: An interview-based approach for measuring daily stressors. *Assessment, 9*(1), 41–55. https://doi.org/10.1177/1073191102091006.

Banerjee, P. (2012). Relationship between perceived psychological stress and depression: Testing moderating effect of dispositional optimism. *Journal of Workplace Behavioral Health, 27*(1), 32–46. https://doi.org/10.1080/15555240.2012.640582.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. Journal of Statistical Software, 67(1). https://doi.org/10.18637/jss.v067.i01.

Baumgardner, A. H. (1990). To know oneself is to like oneself: Self-certainty and self-affect. *Journal of Personality and Social Psychology, 58*(6), 1062–1072. https://doi.org/10.1037/0022-3514.58.6.1062.

Boland, A., & Cappeliez, P. (1997). Optimism and neuroticism as predictors of coping and adaptation in older women. *Personality and Individual Differences, 22*(6), 909–919. https://doi.org/10.1016/S0191-8869(96)00251-6.

Bolger, N., Stadler, G., & Laurenceau, J.-P. (2012). Power analysis for intensive longitudinal studies. In *Handbook of research methods for studying daily life* (pp. 285–301). The Guilford Press.

Brim, Q. G., & Featherman, D. L. (1998). *Surveying midlife development in*. the United States.

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. Advances in Methods and Practices in Psychological Science, 2(2), 156–168. https://doi.org/10.1177/2515245919847202.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in linear mixed effects models. Journal of Statistical Software, 82(13). https://doi.org/10.18637/jss.v082.i13.

Lai, J. C. L. (2009). Dispositional optimism buffers the impact of daily hassles on mental health in Chinese adolescents. *Personality and Individual Differences, 47*(4), 247–249. https://doi.org/10.1016/j.paid.2009.03.007.

Muthén, B. O., & Muthén, L. K. (2012). Mplus version 7: User's guide. *Author*..

R Core Team. (2020). R: A language and environment for statistical computing. (3.6.3) [Computer software]. R Foundation for Statistical Computing. https://www.R-project.org/.

Rush, J., Rast, P., Almeida, D. M., & Hofer, S. M. (2019). Modeling long-term changes in daily within-person associations: An application of multilevel SEM. *Psychology and Aging, 34*(2), 163–176. https://doi.org/10.1037/pag0000331.

Ryff, C. D., & Almeida, D. (2018). Midlife in the United States (MIDUS Refresher): Daily Diary Project, 2012-2014: Version 1 [Data set]. Inter-University Consortium for Political and Social Research. https://doi.org/10.3886/ICPSR37083.V1.

Ryff, C. D., Almeida, D., Ayanian, J., Binkley, N., Carr, D., Coe, C., Davidson, R., Grzywacz, J., Karlamangla, A., Krueger, R., Lachman, M., Love, G., Mailick, M., Mroczek, D., Radler, B., Seeman, T., Sloan, R., Thomas, D., Weinstein, M., & Williams, D. (2016). Midlife in the United States (MIDUS Refresher), 2011-2014: Version 3 [Data set]. Inter-University Consortium for Political and Social Research. https://doi.org/10.3886/ICPSR36532.V3.

Ryff, C. D., & Almeida, D. M. (2009). Midlife in the United States (MIDUS 2): Daily Stress Project, 2004-2009: Version 2 [Data set]. Inter-University Consortium for Political and Social Research. https://doi.org/10.3886/ICPSR26841.V2.

Ryff, C. D., Almeida, D. M., Ayanian, J., Carr, D. S., Cleary, P. D., Coe, C., Davidson, R., Krueger, R. F., Lachman, M. E., Marks, N. F., Mroczek, D. K., Seeman, T., Seltzer, M. M., Singer, B. H., Sloan, R. P., Tun, P. A., Weinstein, M., & Williams, D. (2007). Midlife in the United States (MIDUS 2), 2004-2006: Version 7 [Data set]. Inter-University Consortium for Political and Social Research. https://doi.org/10.3886/ICPSR04652.V7.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the life orientation test. *Journal of Personality and Social Psychology, 67*(6), 1063–1078. https://doi.org/10.1037/0022-3514.67.6.1063.

Snijders, T. (2005). Power and sample size in multilevel modeling. In B. S. Everitt & D. C. Howell (Eds.). *Encyclopedia of Statistics in Behavioral Science* (Vol. 3, pp. 1570–1573). Wiley.

Wirtz, D., Chiu, C., Diener, E., & Oishi, S. (2009). What constitutes a good life? Cultural differences in the role of positive and negative affect in subjective well-being. *Journal of Personality, 77*(4), 1167–1196. https://doi.org/10.1111/j.1467-6494.2009.00578.x.