**Grateful Expectations:
Cultural Differences in the Curvilinear Association between Age and Gratitude**

William J. Chopik

Rebekka Weidmann

Jeewon Oh

Mariah F. Purol

Michigan State University

Word Count: 4793

Manuscript in press at the *Journal of Social and Personal Relationships*

Author Note

Correspondence concerning this manuscript should be addressed to William J. Chopik, Department of Psychology, Michigan State University, 316 Physics Rd., East Lansing, Michigan 48824. E-mail: chopikwi@msu.edu.

This research was supported by grants from the National Institute of Aging (2 R03 AG054705-01A1) and the Templeton Foundation's Pathways to Character Initiative awarded to the first author. The research was also supported by a mobility fellowship from the Swiss National Science Foundation awarded to the second author. We thank Ryan Niemiec and the VIA Institute for providing the data for this project.

Abstract

Recent research suggests that the association between age and gratitude might be *curvilinear*—despite gratitude ostensibly being higher in middle-age, it might be lower in older adulthood. It is unclear if this curvilinear pattern of age differences in gratitude is found in other samples and whether its manifestation depends on contextual (i.e., national/cultural) characteristics. The current study examined cultural variation in the curvilinear effect of age on gratitude in a sample of over 4.5 million participants from 88 countries. Participants from countries with lower levels of human development, a shorter-term orientation, and higher levels of indulgence reported higher levels of gratitude. Cultural moderation effects were very small, suggesting that curvilinear effects of age on gratitude may be relatively comparable across cultures.

Keywords: gratitude, curvilinear associations, age differences, cultural variation, Hofstede's cultural dimensions

Gratitude, the tendency to feel and express thankfulness, is associated with many positive emotional, relational, and health outcomes (Algoe, 2012; Hill et al., 2013). Luckily, with age comes an increased gift of gratitude—older adults tend to report experiencing a variety of more positive emotions, including, in some studies, gratitude (Kern et al., 2014; Reed & Carstensen, 2012). However, recent research suggests that the association between age and gratitude might be *curvilinear*—despite gratitude ostensibly being higher among middle-aged adults, it might be lower among older adults, which is occasionally seen in other psychological characteristics (Chopik et al., 2019; Gerstorf et al., 2008). It is unclear if this curvilinear pattern of age differences in gratitude is found in other samples and whether its manifestation depends on contextual (i.e., national/cultural) characteristics. We revisit the question of how gratitude differs by age—and how these age differences might be affected by the cultural context in a large sample of 4.5 million people from 88 different countries.

Lifespan Development of Gratitude

One explanation for why older adults report more positive emotional experiences is that they become aware that time is limited, which leads them to prioritize personally meaningful events that maintain emotional balance and positivity (Fung et al., 1999). One of the ways that people achieve this is by increasing their investments in relationships with close, significant others and minimizing adversarial interactions with others (Luong et al., 2011). As a result, middle-aged and older adults tend to pay more attention to and remember positively valenced stimuli (i.e., the positivity effect; Reed & Carstensen, 2012).

One consequence of this positivity effect is higher levels of positive psychological characteristics, like gratitude. Higher levels of gratitude among middle-aged and older adults likely also reflect higher affective benefits derived from close relationships—gratitude helps bind

relationships together and remind relational partners of positive traits and behaviors exchanged (Algoe, 2012). However, gratitude might not have a simple linear association with age. In three studies of over 30,000 participants, Chopik et al. (2019) found surprising evidence of a curvilinear relationship between gratitude and age, such that gratitude might be lower or flat among older adults. This effect joins a growing list of nonlinear associations in the field of relationships research (Girme, 2020). Lower levels of gratitude in late life are also consistent with lifespan theories noting that maintaining positive emotions in the face of dramatic declines in physical or mental health can be difficult (coined "terminal decline"; Gerstorf et al., 2008). In addition, age differences, particularly later in life, might be dependent on contextual or cultural factors, as some of the most dramatic declines were seen in a multi-national sample (Chopik et al., 2019).

Cultural Differences in Gratitude

Unfortunately, because past research has relied on relatively small samples and few countries, it is difficult to make firm predictions about how even mean levels of gratitude differ across cultures, let alone how age differences in gratitude vary across cultures. From the evidence that does exist, people from European and North American cultures that have higher levels of individualism and indulgence report more intensely experiencing positive emotions (e.g., joyful, lively, confident, attentive; Leu et al., 2011). Therefore, people from individualistic and indulgent cultures may likewise report more gratitude despite it being a primarily other-focused emotion. Indeed, in smaller studies, people from Western/European cultures are slightly more likely to express gratitude (Floyd et al., 2018). There is also evidence that European Americans report increases in positive emotions in response to gratitude interventions compared to more mixed responses from Asian Americans and Indians (Corona et al., 2020; Titova et al.,

2017). Another example comes from a study of children from seven different countries: although countries might differ in how they express gratitude on average, age differences are approximately the same across cultures (also see Mendonça et al., 2018; Wang et al., 2015). Lastly, gratitude shares many of the same antecedents and consequences across cultures, such as perspective taking, future orientations, and individual and relational well-being (e.g., Srirangarajan et al., 2020; Tudge et al., 2015).

However, work on ostensibly related characteristics (e.g., personality traits) suggests that age differences might vary across countries (Bleidorn et al., 2013). Does living in a society that prioritizes the expression and intensity of positive emotions (e.g., high in indulgence) make people experience more gratitude over time? Is living in a comfortable (e.g., rich, equal, developed) society associated with higher gratitude across life or do people from these countries take positive things for granted? Is living in a collectivistic country, that stresses tightly knit social networks and interdependence, associated with higher gratitude? Unfortunately, much of the work to date has compared different manifestations of gratitude among young people from few countries (e.g., typically two at a time; Morgan et al., 2014). Other efforts to characterize cross-cultural and contextual variation in gratitude also tend to rely on relatively homogeneous samples from a single country (Bernabe-Valero et al., 2020; Merçon-Vargas et al., 2018; Naito & Washizu, 2015).

The Current Study

We adopted an exploratory approach regarding which cultural factors might predict gratitude and moderate age differences in gratitude. We examined the effects of economic, contextual, and developmental conditions on gratitude (e.g., gross-domestic product, income inequality, human development, population density), given their links to positive emotions and

well-being (e.g., Cheung, 2018). We also examined the effects of Hofstede's cultural dimensions (i.e., power distance, individualism/collectivism, masculinity/femininity, uncertainty avoidance, long-term orientation, and indulgence/restraint) on gratitude.

The study was not pre-registered. We hypothesized that there would be a curvilinear effect of age on gratitude. We also expected people from more economically privileged, equal, and developed countries to report higher levels of gratitude. We also expected individualism, which has implications for emotional experiences (Diener & Diener, 2009; Mendonça et al., 2018), to be associated with higher gratitude, and people from countries that prioritize positive emotions (e.g., high indulgence/low restraint) to report higher levels of gratitude. However, overall, we did not have any formal hypotheses for the remaining predictors of gratitude—and how they would moderate curvilinear age differences—because of the mixed or altogether missing (e.g., power distance) evidence and small number of countries from prior work.

Method

Participants and Procedures

Participants were 4,544,507 respondents who completed a measure of gratitude at the VIA Institute on Character website (www.viacharacter.org) from 2013 to 2020. The sample was 66.3% women and had a median age of 25-34 years old. Participants self-selected their age group: under 13 ($N = 5,681$), 13-17 ($N = 184,634$), 18-24 ($N = 1,070,681$), 25-34 ($N = 1,143,436$), 35-44 ($N = 847,845$), 45-54 ($N = 619,588$), 55-64 ($N = 301,361$), 65-74 ($N = 66,726$), and 75+ ($N = 11,238$); some participants had missing data on age but were retained for testing cultural differences. Because the website was primarily used for measurement construction and validation, additional demographic characteristics beyond age, gender, and current country are not available. Participants chose one of 48 different languages in which to

complete the questionnaire.

Users provided completed various short- (120-item) or long-form versions (240-item) of a character strengths questionnaire that both included the same measure of gratitude (Peterson & Seligman, 2004). They received feedback on their character strengths in exchange for participating. We used data from the short-form calculated scales to ensure a consistent set of items across participants.

We used an inclusion criterion of having at least 1,000 participants per country. This resulted in 88 countries that ranged in size from 1,005 (Algeria) to 1,924,690 (United States) with a median sample size of 6,962 ($M = 51,642.13$, $SD = 214,821.80$). The full list of countries, sample sizes, and rankings can be found in Supplementary Table 1.

Given the large statistical power afforded by the current study, we largely interpret the results in terms of effect sizes, but did not specify a smallest effect size of interest in the current study. Given the large sample size and many exploratory moderation tests, we adopted a more conservative alpha threshold ($p = .005$), do not discuss effects that fall above this threshold, and discuss the effects in terms of effect sizes throughout.

Measures

Gratitude

Gratitude was measured using a 5-item version of the gratitude subscale of the Values in Action Inventory of Strengths (VIA-IS; McGrath, 2016; Peterson & Seligman, 2004).

Participants responded to each item (e.g., “When I look at my life, I find many things to be grateful for.”) on a 5-point scale ranging from 1(*very much unlike me*) to 5(*very much like me*).

Responses to the five items were averaged to yield a composite of gratitude ($\alpha = .87$; $M = 3.94$, $SD = .62$) which correlates highly ($r = .78$) with more traditional measures of gratitude (Chopik

et al., 2019).

Economic and Cultural Variables

Because of our exploratory approach to predicting cross-cultural variability in curvilinear effects of age on gratitude, we took a holistic approach and considered a broad array of cultural factors and economic/structural factors. Doing so ensured that the effects of cultural values could be considered distinct from broader, institutional or economic characteristics of a country.

Specifically, we examined and controlled for economic (e.g., GDP, inequality), structural (e.g., population density, human development), and cultural (e.g., Hofstede's dimensions) variables.

Country-level gross-domestic product (GDP) per capita ($n=88$ countries had available data; Central Intelligence Agency, 2011), *the GINI index of income inequality* ($n=78$ countries had available data; Central Intelligence Agency, 2011), and *human development index* ($n=86$ countries had available data; United Nations, 2020) were gathered as country-level characteristics that measure the economic and developmental conditions of a country. GDP was log-transformed given its skewed distribution. The human development index is an omnibus measure that combines standard of living (i.e., gross national income per capita), knowledge (e.g., expected and mean years of schooling), and the ability to live a long life (i.e., life expectancy at birth). A country's *population density* (operationalized as the number of human inhabitants per square mile within a country) was also included as an imperfect measure of the amount other people in a participant's immediate environment, which might have implications for gratitude ($n=88$ countries with data available; UNDESA, 2016).

Hofstede's six dimensions of cultural variation were also included in the analysis (Hofstede et al., 2010). *Power Distance* measures the degree to which a culture is accepting of inequality. *Individualism/collectivism* measures the degree to which people prefer loosely knit

social networks and individuality (individualism; higher values) versus tightly knit social networks and interdependence with others (collectivism; lower values). *Masculinity/Femininity* assesses the degree to which a culture can be characterized by assertiveness and competitiveness (masculinity; higher values) or nurturance and cooperation (femininity; lower scores). *Uncertainty Avoidance* measures the degree to which a country's citizens are uncomfortable with uncertainty and ambiguity. *Long-Term Orientation* assesses the outlook of a culture; countries with a long-term orientation place more importance on the future. *Indulgence v. restraint* measures the degree to which a society allows free gratification of basic and natural human drives related to enjoyment of life (relative to a suppression of gratification of needs by strict social norms). Country-level scores on all of the dimensions were available for 85 countries in the current analyses (and for a total of 78 and 76 countries for long-term orientation and indulgence v. restraint, respectively).

Results

Mean levels of gratitude, sample size, and rankings for each country are provided in Supplementary Table 1. The five countries with the highest levels of gratitude were Nigeria, Ghana, Mexico, Ecuador, and Kenya. The five countries with the lowest levels of gratitude were Lithuania, Russia, Poland, Ukraine, and Latvia. Every country reported mean-levels of gratitude above the scale midpoint of 3. Figure 1 depicts cross-cultural differences in gratitude. Higher gratitude seemed to be more common in developed Western countries and Africa; lower gratitude seemed to be more common in Eastern Europe and North Asia.¹

¹ According to criteria provided by Rutkowski and Svetina (2014) on testing for measurement invariance with a large number of groups, we found that the VIA gratitude scale showed strong/scalar invariance ($\Delta\text{CFA} = .011$, $\Delta\text{RMSEA} = .005$; metric invariance: $\Delta\text{CFA} = .016$, $\Delta\text{RMSEA} = .028$).

Age Differences in Gratitude

We modeled the effects of age, age², and age³ on individual levels of gratitude, controlling for gender (-1 = men, 1 = women) in a multi-level analysis in which participants were nested within country.² Correlation coefficients are reported as a measure of effect size corrected for the non-independence of people nested within countries. Consistent with previous research, age ($b = .071$, $r = .082$, $p < .001$), age² ($b = .005$, $r = .012$, $p < .001$), and age³ ($b = -.001$, $r = -.006$, $p < .001$) were all significant predictors of gratitude (see Supplementary Table 3 for full estimates). As seen in Figure 2, gratitude was higher among older adults and lower among younger adults. However, age differences were relatively flat among children and adolescents and adults over the age of 55 (i.e., the age differences were most dramatic among younger and middle-aged adults). Women reported higher levels of gratitude compared to men ($b = .082$, $r = .106$, $p < .001$).

Cultural Differences in Gratitude

We next added the main effects of our cultural variables to the aforementioned models (see Supplementary Table 4). Most cultural variables were unrelated to gratitude ($ps \geq .016$). However, participants from countries with lower levels of human development ($b = -.810$, $r = -.426$, $p = .001$), a shorter-term orientation ($b = -.003$, $r = -.431$, $p = .001$), and higher levels of indulgence ($b = .004$, $r = .581$, $p < .001$) reported higher levels of gratitude.

² In the initial years of data collection, age was measured continuously. Partway through data collection though, participants were provided with these age groupings with which to self-identify. We used these latter groupings as a way to maximize the data available for analysis. One concern is that using these ordinal groupings is that they are not symmetric—there are both broad and more fine-grained at younger ages. Treating them in a linear fashion could obscure for fine-grained differences. In a supplementary analysis, we re-ran the models using the continuous age variable for the 65.22% of the sample that has information on continuous age. The results were identical in terms of significance, although effect sizes varied slightly. As seen in Supplementary Figure 1, the pattern of age differences using the continuous age metric roughly approximated the results seen in Figure 2.

Cultural Moderation of Age Differences in Gratitude

We next computed all two-way interactions between the age terms and the cultural variables and entered them into the aforementioned models (see Supplementary Table 5). Many cultural factors moderated the effects of age; however, the effects were relatively small ($r_s \leq .007$). Indeed, the effect sizes of the age terms rarely differed to the third decimal place when decomposing the effects of age at $\pm$ one standard deviation at each cultural variable (see Supplementary Table 6). For example, the age $\times$ individualism/collectivism interaction was among the “largest” interaction effects observed ($b = -.001$, $r = -.006$, $p < .001$). However, the linear effect of age among people from individualistic countries ($r = .008$) was comparable to people from collectivistic countries ($r = .009$), despite the significant differences in these effects given the sample size of the current study. As seen in Figure 3, across different strata of individualism/collectivism, older adults reported higher gratitude than younger adults. There was some evidence that the curvilinear effects were more accentuated among people from collectivistic cultures (i.e., older adults were lower in gratitude) whereas older adults from individualistic countries maintained high levels of gratitude. This is consistent with individualistic cultures focusing on maintaining intense positive emotions even in later life (Kitayama et al., 2020; Leu et al., 2011). However, it is important to interpret the cultural moderation effects in their appropriate context. Although there were many significant interaction effects that could be of substantive interest, the effect sizes were so small that they likely do not warrant a discussion of their practical interest.

Discussion

Middle-aged adults reported more gratitude than younger adults—consistent with increases in emotional balance and positivity (Reed & Carstensen, 2012); however, gratitude was

comparable among older adults—consistent with positivity likely being limited by physical and mental health challenges that accompany older adulthood. Importantly, context mattered—people from countries lower in human development, with a more short-term orientation, and those higher in indulgence reported higher gratitude. However, these factors did not exert a strong moderating influence on age differences in gratitude.

The largest predictors ($r_s > .40$) of variation in gratitude were human development, long-term orientation, and indulgence. Focusing on the moment (e.g., a short-term orientation) and prioritizing positive emotions (e.g., indulgence) seem like logical correlates of gratitude—a positive emotion embedded in immediate relational contexts. Surprisingly, living in a culture with higher levels of human development (an index of life expectancy, education, average national income) was associated with *lower* gratitude. It is unclear why this might be the case. It could be that people who perceive a high standard of human development as a norm might take the plentiful educational opportunities and long-life expectancy for granted and report lower gratitude. Likewise, people living in countries with lower scores on human development might perceive shorter time horizons (Fung et al., 1999) and ultimately prioritize positive interpersonal emotions (like gratitude). Ultimately, future research can more purposely examine the associations between structural and contextual circumstances on the experience of gratitude.

To give people a practical sense of the effect sizes for this study, every one-unit increase in gratitude on this five-point scale corresponds to a 1.08 increase on a seven-point scale for subjective well-being (Chopik et al., 2019). Although the comparison level is different (comparing individuals versus the average person in a country high in indulgence and the average person in a country low in indulgence), the difference between individuals from these two countries would constitute a relatively small difference.

Curvilinear age differences were relatively similar across countries, consistent with previous work among children and adolescents (Mendonça et al., 2018). The fact that curvilinear effects among adults were seen in most countries has many implications for relationship and developmental sciences. It suggests that maintaining or facilitating positive emotions and relationships—of which gratitude is a central construct (Algoe, 2012)—and the subsequent limits imposed by older adulthood may be found across highly divergent contexts. Indeed, the idea that time horizons shorten is universal and not controversial—life shortens as people age, regardless of where you live. However, the commonality of psychological and interpersonal consequences of shortening time horizons may be surprising: across the vast majority of cultures studied here, as people age, they invest in positive emotional experiences and ultimately have less interpersonal conflict with close others (Luong et al., 2011). Indeed, positive close relationships are thought to be one of the ameliorating factors in reducing mortality-related concerns (Chopik, 2017; Mikulincer & Florian, 2000). It could be that gratitude serves as a key psychological mechanism that links mortality, time horizons, and positive close relationships together across life. Future research can explore these possibilities.

Limitations and Future Directions

Redressing the limitations of this study can advance our understanding of the development of and contextual variation in gratitude.

First, the cross-sectional nature of the study obscures the fact that age differences in gratitude might reflect either cohort differences (e.g., that more recently born people are lower in gratitude), developmental processes (e.g., that gratitude increases until late life before reaching a plateau), or both. To date, little long-term longitudinal research exists to disentangle these possibilities. Worth noting, the fact that age differences were relatively similar across cultures

might lend more credence to the interpretation that these age differences reflect developmental processes. After all, cohort differences in psychological characteristics are often attributable to social and cultural characteristics that vary across historical time. Across the 88 countries, all of which vary in contextual characteristics, age differences in gratitude were relatively similar. Nevertheless, longitudinal studies that have multiple assessment waves over long intervals, and a developmentally and culturally diverse sample, are needed to properly track the longitudinal development and stability of gratitude across the lifespan. Related, future research can more deliberately sample participants among the oldest old in society to increase the reliability of research in this age group and allow us to better zoom in on whether the “terminal decline” of psychological characteristics is similar across different cultures.

Second, the exact mechanisms leading to higher gratitude are not well understood. Although we found that, on average, older adults were higher in gratitude than younger adults, there is likely a great deal of heterogeneity in changes in gratitude across life (i.e., some people increase in gratitude more dramatically, some decrease in gratitude, and some report stable gratitude levels). To date, experimental manipulations of gratitude serve as a promising indicator that momentary feelings of gratitude are malleable (Davis et al., 2016). However, it is unclear about the long-term consequences of either gratitude interventions or the developmental processes already described above in determining how people change in gratitude. One concrete direction for future research could be linking bidirectional influences between gratitude and physical health using variants of cross-lagged panel models. In other words, are changes in gratitude a byproduct of concurrent changes in other characteristics, like positivity or health? Such processes are often seen with other positive characteristics, and we expect the same to be true for gratitude. Answers to these and other questions can provide researchers and practitioners

with a better understanding of gratitude, where it originates, and the individual and contextual influences on how it changes over time.

Finally, although large online data collection efforts can increase the accessibility for some individuals to participate in research, this is nevertheless a convenience sample. This limitation is additionally compounded by the lack of demographic and contextual information we had on participants, such as their socio-economic status, disability status, broader gender identity, race/ethnicity, or literacy skills. As a result, the samples likely varied in the degree to which they represented the typical population of a given country. This limitation is especially true for countries with limited internet access and those who are otherwise economically vulnerable or minoritized. Future research should more deliberately examine these factors and their intersection with gratitude-related phenomena (Hartanto et al., 2019), while collecting more diverse and representative samples with respect to demographic and regional characteristics.

Conclusion

In closure, middle-aged and older adults were higher in gratitude compared to younger adults, but gratitude was relatively comparable when comparing middle-aged and older adults. The fact that these curvilinear age effects were so comparable across countries suggests that there may be lifespan shifts toward greater positivity in close relationships that are seen across most contexts. Future research can more carefully examine the antecedents of variation in gratitude across the lifespan.

References

- Algoe, S. B. (2012). Find, remind, and bind: The functions of gratitude in everyday relationships. *Social and Personality Psychology Compass*, 6, 455-469.
- Bernabe-Valero, G., Blasco-Magraner, J. S., & García-March, M. R. (2020). Gratitude Questionnaire-20 Items (G20): A cross-cultural, psychometric and crowdsourcing analysis. *Frontiers in Psychology*, 11, 626330.
- Bleidorn, W., Klimstra, T. A., Denissen, J. J. A., Rentfrow, P. J., Potter, J., & Gosling, S. D. (2013). Personality maturation around the world: A cross-cultural examination of social-investment theory. *Psychological Science*, 24, 2530-2540.
- Central Intelligence Agency. (2011). *The world factbook*.
<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2102rank.html>
- Chopik, W. J. (2017). Death across the lifespan: Age differences in death-related thoughts and anxiety. *Death Studies*, 41, 69-77.
- Chopik, W. J., Newton, N. J., Ryan, L. H., Kashdan, T. B., & Jarden, A. J. (2019). Gratitude across the life span: Age differences and links to subjective well-being. *The Journal of Positive Psychology*, 14, 292-302.
- Corona, K., Senft, N., Campos, B., Chen, C., Shiota, M., & Chentsova-Dutton, Y. E. (2020). Ethnic variation in gratitude and well-being. *Emotion*, 20, 518.
- Davis, D. E., Choe, E., Meyers, J., Wade, N., Varjas, K., Gifford, A., Quinn, A., Hook, J. N., Van Tongeren, D. R., & Griffin, B. J. (2016). Thankful for the little things: A meta-analysis of gratitude interventions. *Journal of Counseling Psychology*, 63, 20.
- Diener, E., & Diener, M. (2009). Cross-cultural correlates of life satisfaction and self-esteem. In E. Diener (Ed.), *Culture and well-being: The collected works of Ed Diener* (pp. 71-91).

- Springer Netherlands. https://doi.org/10.1007/978-90-481-2352-0_4
- Floyd, S., Rossi, G., Baranova, J., Blythe, J., Dingemanse, M., Kendrick, K. H., Zinken, J., & Enfield, N. J. (2018). Universals and cultural diversity in the expression of gratitude. *Royal Society Open Science*, 5, 180391.
- Fung, H. H., Carstensen, L. L., & Lutz, A. M. (1999). Influence of time on social preferences: implications for life-span development. *Psychology and Aging*, 14, 595-604.
- Gerstorf, D., Ram, N., Estabrook, R., Schupp, J., Wagner, G. G., & Lindenberger, U. (2008). Life satisfaction shows terminal decline in old age: Longitudinal evidence from the German Socio-Economic Panel Study (SOEP). *Developmental Psychology*, 44, 1148-1159.
- Girme, Y. U. (2020). Step out of line: Modeling nonlinear effects and dynamics in close-relationships research. *Current Directions in Psychological Science*, 29, 351-357.
- Hartanto, A., Lee, S. T., & Yong, J. C. (2019). Dispositional gratitude moderates the association between socioeconomic status and interleukin-6. *Scientific Reports*, 9, 1-10.
- Hill, P. L., Allemand, M., & Roberts, B. W. (2013). Examining the pathways between gratitude and self-rated physical health across adulthood. *Personality and Individual Differences*, 54, 92-96.
- Kern, M. L., Eichstaedt, J. C., Schwartz, H. A., Park, G., Ungar, L. H., Stillwell, D. J., Kosinski, M., Dziurzynski, L., & Seligman, M. E. (2014). From "Sooo excited!!!" to "So proud": using language to study development. *Developmental Psychology*, 50, 178-188.
- Kitayama, S., Berg, M., & Chopik, W. J. (2020). Culture and wellbeing in late adulthood: Theory and evidence. *American Psychologist*, 75, 567-576.
- Leu, J., Wang, J., & Koo, K. (2011). Are positive emotions just as “positive” across cultures?

- Emotion*, 11, 994-999.
- Luong, G., Charles, S. T., & Fingerman, K. L. (2011). Better with age: Social relationships across adulthood. *Journal of Social and Personal Relationships*, 28, 9-23.
- McGrath, R. E. (2016). Measurement invariance in translations of the VIA Inventory of Strengths. *European Journal of Psychological Assessment*, 32, 187-194.
- Mendonça, S. E., Merçon-Vargas, E. A., Payir, A., & Tudge, J. R. H. (2018). The development of gratitude in seven societies: Cross-cultural highlights. *Cross-cultural Research*, 52, 135-150.
- Merçon-Vargas, E. A., Poelker, K. E., & Tudge, J. R. H. (2018). The development of the virtue of gratitude: Theoretical foundations and cross-cultural issues. *Cross-cultural Research*, 52, 3-18.
- Mikulincer, M., & Florian, V. (2000). Exploring individual differences in reactions to mortality salience: Does attachment style regulate terror management mechanisms? *Journal of Personality and Social Psychology*, 79, 260-273.
- Morgan, B., Gulliford, L., & Kristjánsson, K. (2014). Gratitude in the UK: A new prototype analysis and a cross-cultural comparison. *The Journal of Positive Psychology*, 9, 281-294.
- Naito, T., & Washizu, N. (2015). Note on cultural universals and variations of gratitude from an East Asian point of view. *The Journal of Behavioral Science*, 10, 1-8.
- Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook and classification*. Oxford University Press.
- Reed, A. E., & Carstensen, L. L. (2012). The theory behind the age-related positivity effect. *Frontiers in Psychology*, 3.

- Srirangarajan, T., Oshio, A., Yamaguchi, A., & Akutsu, S. (2020). Cross-cultural nomological network of gratitude: Findings from Midlife in the United States (MIDUS) and Japan (MIDJA). *Frontiers in Psychology, 11*, 571-571.
- Titova, L., Wagstaff, A. E., & Parks, A. C. (2017). Disentangling the effects of gratitude and optimism: A cross-cultural investigation. *Journal of Cross-cultural Psychology, 48*, 754-770.
- Tudge, J. R., Freitas, L. B., & O'Brien, L. T. (2015). The virtue of gratitude: A developmental and cultural approach. *Human Development, 58*, 281-300.
- UNDESA. (2016). *Population density*. <https://population.un.org/wpp/>
- United Nations. (2020). *Human Development Report*. <http://hdr.undp.org/en/countries>
- Wang, D., Wang, Y. C., & Tudge, J. R. H. (2015). Expressions of gratitude in children and adolescents: Insights from China and the United States. *Journal of Cross-cultural Psychology, 46*, 1039-1058.

Differences in Gratitude across Countries

Figure 2

Age Differences in Gratitude

Note. Caution is warranted as the extreme age groups (i.e., under 13 and over 75) had relatively few participants in them.

Figure 3

Age Differences at Different Quartiles of Individualism/collectivism

Note. Caution is warranted as the extreme age groups (i.e., under 13 and over 75) had relatively few participants in them.

Supplementary Table 1. Mean Levels and Descriptives of Country-level Differences in Gratitude and Country-level Indicators

Country	Mean	SD	N	Rank	GDP	GINI	HDI	Pop. Density	Power Distance	Ind/Coll	Masc/ Fem	UAI	LTO	IndulgRes
Afghanistan	3.712	0.798	31516	36	19101		0.511	127						
Albania	3.540	0.845	1215	63	15278	33.2	0.795	258	90	20	80	70	61	15
Algeria	3.721	0.837	1005	33	169988	27.6	0.748	47	80	35	35	70	26	32
Andorra	3.444	0.817	1568	79	3154		0.868	425						
Argentina	3.553	0.790	8107	61	449663	41.4	0.845	42	49	46	56	86	20	62
Armenia	3.662	0.791	1060	44	13673	34.4	0.776	258	85	22	50	88	61	25
Australia	3.719	0.719	568566	34	1392681	34.4	0.944	9	38	90	61	51	21	71
Austria	3.551	0.761	6415	62	446315	29.7	0.922	275	11	55	79	70	60	63
Bangladesh	3.609	0.804	1834	50	302571	32.4	0.632	3059	80	20	55	60	47	20
Belgium	3.559	0.768	19784	59	529607	27.4	0.931	973	65	75	54	94	82	57
Brazil	3.778	0.763	165726	25	1839758	53.9	0.765	65	69	38	49	76	44	59
Bulgaria	3.515	0.766	2260	65	67927	40.4	0.816	162	70	30	40	85	69	16
Canada	3.745	0.758	245156	30	1736426	33.8	0.929	10	39	80	52	48	36	68
Chile	3.833	0.783	7229	21	282318	44.4	0.851	60	63	23	28	86	31	68
China	3.597	0.737	42715	54	1.4E+07	38.5	0.761	378	80	20	66	30	87	24
Colombia	3.919	0.764	9864	14	323803	50.4	0.767	106	67	13	64	80	13	83
Costa Rica	3.936	0.746	3980	12	61774	48.0	0.810	256	35	15	21	86		
Croatia	3.553	0.768	2047	60	60416	30.4	0.851	187	73	33	40	80	58	33
Czech Republic	3.362	0.748	3835	81	246489	24.9	0.900	351	57	58	57	74	70	29
Denmark	3.612	0.696	99476	49	348078	28.7	0.940	349	18	74	16	23	35	70
Dominican Republic	3.839	0.778	1237	20	88941	43.7	0.756	560	65	30	65	45	13	54
Ecuador	4.068	0.725	3524	4	107436	45.4	0.759	165	78	8	63	67		
Egypt	3.773	0.714	8123	27	303175	31.5	0.707	262	70	25	45	80	7	4
El Salvador	3.996	0.729	1070	7	27023	38.6	0.673	825	66	19	40	94	20	89
Estonia	3.337	0.756	2208	83	31387	30.4	0.892	76	40	60	30	60	82	16
Finland	3.457	0.780	39271	76	268761	27.4	0.938	42	33	63	26	59	38	57
France	3.643	0.782	162296	47	2715518	31.6	0.901	319	68	71	43	86	63	48

Georgia	3.754	0.781	2004	29	17743	36.4	0.812	139	65	41	55	85	38	32
Germany	3.486	0.738	38802	71	3845630	31.9	0.947	603	35	67	66	65	83	40
Ghana	4.143	0.633	1183	2	66984	43.5	0.611	329	80	15	40	65	4	72
Greece	3.601	0.810	7169	52	209853	34.4	0.888	210	60	35	57	100	45	50
Guatemala	4.022	0.760	1687	6	76710	48.3	0.663	421	95	6	37	98		
Hong Kong	3.509	0.733	27453	66	366030		0.949	17565	68	25	57	29	61	17
Hungary	3.405	0.776	4253	80	160967	30.6	0.854	272	46	80	88	82	58	31
Iceland	3.593	0.684	9143	55	24188	26.8	0.949	9	30	60	10	50	28	67
India	3.657	0.743	59302	45	2875142	37.8	0.645	1066	77	48	56	40	51	26
Indonesia	3.655	0.686	18779	46	1119191	39.0	0.718	367	78	14	46	48	62	38
Iran	3.488	0.784	2519	70	445345	40.8	0.783	132	58	41	43	59	14	40
Ireland	3.670	0.736	25447	42	388699	32.8	0.955	181	28	70	68	35	24	65
Israel	3.597	0.740	16858	53	395099	39.0	0.919	1092	13	54	47	81	38	
Italy	3.481	0.788	15670	73	2001244	35.9	0.892	518	50	76	70	75	61	30
Japan	3.540	0.709	58287	64	5081770	32.9	0.919	863	54	46	95	92	88	42
Jordan	3.767	0.704	1491	28	43744	33.7	0.729	315	70	30	45	65	16	43
Kazakhstan	3.448	0.743	1414	78	180162	27.5	0.825	17	88	20	50	88	85	22
Kenya	4.056	0.698	4652	5	95503	40.8	0.601	212	70	25	60	50		
Kuwait	3.979	0.709	1442	10	134761		0.806	642	90	25	40	80		
Latvia	3.335	0.738	1456	84	34117	35.6	0.866	77	44	70	9	63	69	13
Lebanon	3.839	0.753	2466	19	53367	31.8	0.744	1741	75	40	65	50	14	25
Lithuania	3.239	0.749	2040	88	54219	37.3	0.882	111	42	60	19	65	82	16
Luxembourg	3.560	0.748	1386	58	71105	34.9	0.916	615	40	60	50	70	64	56
Malaysia	3.725	0.708	17384	32	364702	41.0	0.810	256	100	26	50	36	41	57
Mexico	4.080	0.704	155587	3	1258287	45.4	0.779	167	81	30	69	82	24	97
Morocco	3.831	0.775	1800	22	118725	39.5	0.686	210	70	46	53	68	14	25
Netherlands	3.490	0.719	42699	69	909070	28.5	0.944	1095	38	80	14	53	67	68
New Zealand	3.685	0.726	60250	40	206929		0.931	49	22	79	58	49	33	75
Nigeria	4.164	0.642	4070	1	448120	35.1	0.539	563	80	30	60	55	13	84
Norway	3.498	0.771	8491	68	403336	27.0	0.957	43	31	69	8	50	35	55

Pakistan	3.691	0.751	5189	39	278222	33.5	0.557	717	55	14	50	70	50	0
Panama	3.871	0.745	1271	17	66801	49.2	0.815	145	95	11	44	86		
Peru	3.793	0.751	3535	24	226848	42.8	0.777	65	64	16	42	87	25	46
Philippines	3.969	0.677	51330	11	376796	44.4	0.718	948	94	32	64	44	27	42
Poland	3.315	0.820	11474	86	592164	29.7	0.880	318	68	60	64	93	38	29
Portugal	3.619	0.790	11946	48	237686	33.8	0.864	289	63	27	31	99	28	33
Puerto Rico	3.891	0.742	1293	16	104989			909	68	27	56	38	0	90
Qatar	3.929	0.730	1317	13	183466		0.848	613						
Romania	3.456	0.759	11422	77	250077	36.0	0.828	211	90	30	42	90	52	20
Russia	3.246	0.765	9399	87	1699877	37.5	0.824	22	93	39	36	95	81	20
Saudi Arabia	3.915	0.732	4013	15	792967		0.854	41	95	25	60	80	36	52
Serbia	3.355	0.808	1537	82	51409	36.2	0.806	231	86	25	43	92	52	28
Singapore	3.718	0.705	36259	35	372063		0.938	20446	74	20	48	8	72	46
Slovakia	3.486	0.741	1573	72	105422	25.2	0.860	288	100	52	100	51	77	28
Slovenia	3.503	0.763	1499	67	53742	24.2	0.917	266	71	27	19	88	49	48
South Africa	3.987	0.704	32250	8	351432	63.0	0.709	125	49	65	63	49	34	63
South Korea	3.471	0.772	79854	75	1642383	31.6	0.916	1338	60	18	39	85	100	29
Spain	3.680	0.741	19462	41	1394116	34.7	0.904	240	57	51	42	86	48	44
Sri Lanka	3.777	0.722	1213	26	84009	39.8	0.782	861	80	35	10	45	45	
Sweden	3.479	0.787	20228	74	530833	28.8	0.945	59	31	71	5	29	53	78
Switzerland	3.663	0.750	16096	43	703082	32.7	0.955	539	34	68	70	58	74	66
Taiwan	3.705	0.732	6755	37	574905			1689	58	17	45	69	93	49
Thailand	3.698	0.684	9734	38	543650	36.4	0.777	336	64	20	34	64	32	45
Turkey	3.602	0.768	20251	51	754412	41.9	0.820	275	66	37	45	85	46	49
Ukraine	3.323	0.749	3880	85	153781	26.1	0.779	180	92	25	27	95	86	14
UAE	3.816	0.723	15783	23	421142	32.5	0.890	303	90	25	50	80		
United Kingdom	3.584	0.749	195323	57	2827113	34.8	0.932	725	35	89	66	35	51	69
United States	3.851	0.732	1924690	18	2.1E+07	41.4	0.926	87	40	91	62	46	26	68
Uruguay	3.736	0.797	1530	31	56046	39.7	0.817	52	61	36	38	98	26	53
Venezuela	3.979	0.782	1738	9	42530	46.9	0.711	91	81	12	73	76	16	100

Vietnam	3.587	0.666	6392	56	261921	35.7	0.704	752	70	20	40	30	57	35
---------	-------	-------	------	----	--------	------	-------	-----	----	----	----	----	----	----

To test for configural, metric (i.e., constraining factor loadings to be equal across countries), and scalar invariance (i.e., constraining item intercepts to be equal across countries) across countries, we ran tests for measurement invariance. Because participants completed different versions of the measures, we tested invariance on participants who completed a five-item version of the measure. Research on confirmatory factor analyses with large numbers of groups suggests a slight relaxation of cut-offs for changes in model fit to signal invariance. Specifically, in traditional settings, some advocate for cut-offs of $\Delta\text{CFI} \leq .01$ and $\Delta\text{RMSEA} \leq .015$ (e.g., Chen, 2007; Putnick & Bornstein, 2016). In research on testing groups of 10-20, Rutkowski and Svetina (2014) have recommended more lax criteria of $\Delta\text{CFI} \leq .02$ and $\Delta\text{RMSEA} \leq .03$ given the various sources of invariance that could be reasonably expected to arise. In the current study, we had 88 groups that represented a wide and diverse spread of countries. Despite these influences and the large number of groups, the VIA gratitude scale showed relatively strong invariance across the cultures examined in the current study.

Supplementary Table 2. Invariance tests for gratitude across cultures

	χ^2	df	CFI	RMSEA	ΔCFI	ΔRMSEA	Δdf	$\Delta\chi^2$
Configural	370971	510	0.818	0.093				
Weak/Metric	383312	846	0.802	0.121	0.016	0.028	336	12341
Strong/Scalar	479505	1266	0.791	0.126	0.011	0.005	420	96193

Supplementary Table 3. Age Differences in Gratitude

	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>r</i>	95% Confidence Interval (<i>r</i>)	
						LB	UB
Intercept	3.680	.023	158.729	< .001			
Age	.071	.0004	166.457	< .001	.082	0.081	0.083
Age ²	.005	.0002	25.218	< .001	.012	0.011	0.013
Age ³	-.001	.0001	-11.678	< .001	-.006	-0.007	-0.005
Gender	.082	.0004	215.187	< .001	.106	0.105	0.107

Note. LB = Lower

Bound; UB = Upper

Bound.

Supplementary Table 4. Age and Cultural Differences in Gratitude

	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>r</i>	95% Confidence Interval (<i>r</i>)	
						LB	UB
Intercept	4.072	.226	18.006	< .001			
Age	.069	.0004	159.326	< .001	.080	0.079	0.081
Age ²	.005	.0002	23.841	< .001	.012	0.011	0.013
Age ³	-.001	.0001	-9.590	< .001	-.005	-0.006	-0.004
Gender	.082	.0004	209.937	< .001	.106	0.105	0.107
GDP	.001	.009	.147	.883	.019	-0.237	0.273
GINI	.003	.002	1.406	.165	.180	-0.080	0.417
HDI	-.810	.224	-3.616	.001	-.426	-0.615	-0.191
Population Density	.00003	.00003	.911	.366	.117	-0.142	0.361
Power Distance	.0004	.001	.448	.656	.059	-0.202	0.311
Individualism/Collectivism	-.001	.001	-1.004	.320	-.131	-0.376	0.132
Masculinity	.002	.001	2.492	.016	.308	0.057	0.523
Uncertainty Avoidance	-.0003	.001	-.479	.634	-.062	-0.315	0.198
Long-term Orientation	-.003	.001	-3.669	.001	-.431	-0.619	-0.197
Indulgence	.004	.001	5.505	< .001	.581	0.383	0.729

Note. LB = Lower Bound; UB = Upper Bound.

Supplementary Table 5. Cultural Moderation of Age Differences in Gratitude

	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>r</i>	95% Confidence Interval (<i>r</i>)	
						LB	UB
Intercept	4.135	.232	17.786	< .001			
Age	.328	.020	16.184	< .001	.008	.007	.009
Age ²	.053	.009	5.821	< .001	.003	.002	.004
Age ³	-.036	.005	-8.760	< .001	-.004	-.005	-.003
Gender	.083	.0004	212.459	< .001	.107	.106	.108
GDP	.003	.009	.385	.702	.050	-.207	.300
GINI	.003	.002	1.227	.225	.158	-.102	.397
HDI	-.852	.230	-3.700	< .001	-.433	-.620	-.200
Population Density	.00003	.00003	.977	.332	.125	-.13300	.3670
Power Distance	.001	.001	.571	.570	.074	-.186	.324
Individualism/Collectivism	-.001	.001	-1.336	.187	-.172	-.411	.089
Masculinity	.002	.001	2.332	.023	.290	.0370	.508
Uncertainty Avoidance	-.0003	.001	-.409	.684	-.053	-.306	.206
Long-term Orientation	-.003	.001	-4.191	< .001	-.478	-.654	-.254
Indulgence	.004	.001	5.108	< .001	.552	.346	.707
Age × GDP	-.003	.001	-5.362	< .001	-.003	-.004	-.002
Age × GINI	-.001	.0002	-5.690	< .001	-.003	-.004	-.002
Age × HDI	-.129	.022	-5.757	< .001	-.003	-.004	-.002
Age × Population Density	.00001	.000003	2.270	.023	.001	.000000	.00200
Age × Power Distance	.0004	.0001	4.671	< .001	-.002	-.0030	-.001
Age × Individualism/Collectivism	-.001	.0001	-11.031	< .001	-.006	-.007	-.0050
Age × Masculinity	-.0003	.00004	-6.483	< .001	-.003	-.0040	-.0020

Age $\times$ Uncertainty Avoidance	.001	.0001	9.870	< .001	.005	.0040	.006
Age $\times$ Long-term Orientation	-.001	.0001	-13.077	< .001	-.007	-.008	-.006
Age $\times$ Indulgence	-.0002	.0001	-3.674	< .001	-.002	-.0030	-.0010
Age ² $\times$ GDP	-.002	.0003	-6.054	< .001	-.003	-.004	-.002
Age ² $\times$ GINI	-.0001	.0001	-.801	.423	-.0004	-.0010	.0010
Age ² $\times$ HDI	-.036	.010	-3.610	.001	-.002	-.003	-.001
Age ² $\times$ Population Density	-.000001	.000001	-.694	.488	-.0004	-.001000	.001000
Age ² $\times$ Power Distance	.0000001	.00004	.003	.997	.000002	-.0010	.0010
Age ² $\times$ Individualism/Collectivism	.0001	.00003	4.383	< .001	.002	.0010	.0030
Age ² $\times$ Masculinity	.00003	.00002	1.248	.212	.0006	.00000	.0020
Age ² $\times$ Uncertainty Avoidance	-.0001	.00002	-2.715	.007	-.001	-.0020	.00000
Age ² $\times$ Long-term Orientation	.0002	.00003	8.774	< .001	.004	.0030	.0050
Age ² $\times$ Indulgence	-.00003	.00002	-1.395	.163	-.001	-.0020	.00000
Age ³ $\times$ GDP	.0005	.0001	4.366	< .001	.002	.0010	.003
Age ³ $\times$ GINI	.0001	.00003	2.136	.033	.001	.00000	.0020
Age ³ $\times$ HDI	.025	.005	5.489	< .001	.003	.002	.004
Age ³ $\times$ Population Density	-.000002	.0000005	-4.727	< .001	-.002	-.003000	-.001000
Age ³ $\times$ Power Distance	.00001	.00002	.598	.550	.0003	-.00100	.00100
Age ³ $\times$ Individualism/Collectivism	.00002	.00001	1.984	.047	.001	.00000	.00200
Age ³ $\times$ Masculinity	.00003	.00001	3.485	< .001	.002	.00100	.00300
Age ³ $\times$ Uncertainty Avoidance	-.0001	.00001	-5.502	< .001	-.003	-.0040	-.00200
Age ³ $\times$ Long-term Orientation	.00004	.00001	3.682	< .001	.002	.00100	.0030
Age ³ $\times$ Indulgence	.0000003	.00001	.029	.997	.00001	-.00100	.00100

Note. LB = Lower Bound; UB = Upper Bound.

Supplementary Table 6. Moderation Results Decomposed at +/- 1 SD at Each Moderator

GDP	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.323	.021	15.692	< .001	.282	.363	.008	Age	.333	.020	16.658	< .001	.294	.372	.008
	Age2	.050	.009	5.462	< .001	.032	.068	.003	Age2	.055	.009	6.177	< .001	.038	.073	.003
	Age3	-.035	.004	-8.445	< .001	-.043	-.027	-.004	Age3	-.037	.004	-9.068	< .001	-.044	-.029	-.005
GINI	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.322	.020	16.422	< .001	.284	.361	.008	Age	.333	.021	15.940	< .001	.292	.374	.008
	Age2	.052	.009	5.955	< .001	.035	.070	.003	Age2	.053	.009	5.686	< .001	.035	.071	.003
	Age3	-.035	.004	-8.922	< .001	-.043	-.028	-.005	Age3	-.036	.004	-8.595	< .001	-.044	-.028	-.004
HDI	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.318	.019	17.000	< .001	.281	.355	.009	Age	.337	.022	15.468	< .001	.295	.380	.008
	Age2	.050	.008	5.978	< .001	.034	.066	.003	Age2	.055	.010	5.682	< .001	.036	.075	.003
	Age3	-.034	.004	-8.996	< .001	-.041	-.026	-.005	Age3	-.038	.004	-8.550	< .001	-.046	-.029	-.004
PopDens	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.342	.019	17.633	< .001	.304	.380	.009	Age	.314	.023	13.764	< .001	.269	.358	.007
	Age2	.051	.009	5.730	< .001	.034	.068	.003	Age2	.054	.010	5.515	< .001	.035	.074	.003
	Age3	-.041	.004	-10.359	< .001	-.049	-.033	-.005	Age3	-.030	.004	-6.787	< .001	-.039	-.022	-.003
Power Dist	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.334	.019	17.229	< .001	.296	.372	.009	Age	.321	.021	15.189	< .001	.280	.363	.008

Age2	.053	.009	6.074	< .001	.036	.070	.003	Age2	.053	.009	5.576	< .001	.034	.071	.003
Age3	-.036	.004	-9.090	< .001	-.043	-.028	-.005	Age3	-.036	.004	-8.437	< .001	-.044	-.028	-.004

Indcoll	High							Low							
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	
Age	.313	.021	15.256	< .001	.273	.353	.008	Age	.342	.020	17.060	< .001	.303	.382	.009
Age2	.055	.009	6.026	< .001	.037	.073	.003	Age2	.050	.009	5.585	< .001	.032	.068	.003
Age3	-.035	.004	-8.486	< .001	-.043	-.027	-.004	Age3	-.036	.004	-9.003	< .001	-.044	-.028	-.005

Masculinity	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.324	.020	15.949	< .001	.284	.364	.008	Age	.331	.020	16.407	< .001	.292	.371	.008
	Age2	.053	.009	5.839	< .001	.035	.071	.003	Age2	.052	.009	5.799	< .001	.035	.070	.003
	Age3	-.035	.004	-8.631	< .001	-.043	-.027	-.004	Age3	-.036	.004	-8.882	< .001	-.044	-.028	-.004

UAI	High							Low								
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>		
	Age	.336	.021	16.342	< .001	.296	.376	.008	Age	.319	.020	15.995	< .001	.280	.358	.008
	Age2	.052	.009	5.623	< .001	.034	.070	.003	Age2	.054	.009	6.018	< .001	.036	.071	.003
	Age3	-.037	.004	-8.843	< .001	-.045	-.029	-.004	Age3	-.035	.004	-8.662	< .001	-.043	-.027	-.004

LTO	High							Low							
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	
Age	.314	.020	15.419	< .001	.274	.354	.008	Age	.341	.020	16.914	< .001	.302	.381	.009
Age2	.057	.009	6.233	< .001	.039	.075	.003	Age2	.049	.009	5.391	< .001	.031	.066	.003
Age3	-.035	.004	-8.538	< .001	-.043	-.027	-.004	Age3	-.036	.004	-8.963	< .001	-.044	-.028	-.005

Indulg/Rest	High							Low						
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	LB	UB	<i>r</i>

Age	.325	.020	15.948	< .001	.285	.365	.008	Age	.331	.020	16.397	< .001	.291	.370	.008
Age2	.052	.009	5.744	< .001	.034	.070	.003	Age2	.053	.009	5.892	< .001	.035	.071	.003
Age3	-.036	.004	-8.722	< .001	-.044	-.028	-.004	Age3	-.036	.004	-8.787	< .001	-.044	-.028	-.004

Supplementary Figure 1.

Age differences in gratitude using the continuous age metric. Error bars represent ± 1 standard error.

References

- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 14, 464-504.
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement Invariance Conventions and Reporting: The State of the Art and Future Directions for Psychological Research. *Developmental Review*, 41, 71-90.
- Rutkowski, L., & Svetina, D. (2014). Assessing the Hypothesis of Measurement Invariance in the Context of Large-Scale International Surveys. *Educational and Psychological Measurement*, 74, 31-57.