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Age-related psychometrics and differences in gratitude and future time perspective across adulthood

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\section*{ABSTRACT}

The current study examined age-related psychometrics and differences in the measurement, mean-levels, variances, and correlations of gratitude and future time perspective across adulthood using data from a cross-sectional survey in a representative Swiss sample ($N = 1684$, age range: 19–98 years). Local structural equation modeling was used to investigate these measurement parameters based on age as a continuous variable instead of using artificial age groupings. After having established a measurement model with three interrelated factors of gratitude, opportunities and time, results indicate that the measurement model demonstrates at least metric measurement invariance for all factors. Gratitude mean-levels and correlations with future time perspective remained stable across the examined age range. We did find a strong decline in perceived remaining opportunities and time across age, and an increase in the variance of these constructs. This suggests that people generally perceive time and opportunities as more limited with increasing age, but that the interindividual differences in this perception are particularly large in old age.

\section*{1. Introduction}

Studies of age trajectories in dispositional gratitude suggest at best a modest increase during adulthood (Chopik, Newton, Ryan, Kashdan, & Jarden, 2019). Instead, additional studies suggest that perceptions of the future rather than chronological age may provide a better explanation (Allemand & Hill, 2016). However, multiple issues confront researchers when estimating associations between these constructs, including that most scales measuring gratitude and perceptions of the future include items that explicitly discuss time and age, which may mean something different to people across the adult years. These issues necessitate analytic techniques that consider the potential for associations between constructs to change across adulthood, without resorting to the use of artificial age groupings. The current study provided an analytically sophisticated investigation into age-related psychometrics and differences in gratitude and perceptions of the future.

1.1. Dispositional gratitude and future time perspective

How one assesses gratitude can yield different age trajectories (Allemand & Hill, 2016). For the current study, the focus is on gratitude as a “generalized tendency to recognize and respond with grateful emotion to the roles of other people's benevolence in the positive experiences and outcomes that one obtains” (Mccullough, Emmons, & Tsang, 2002, p. 112). Another approach is to consider gratitude in specific life domains, which seems to show age-graded trends; for instance, older people tend to be more grateful for their health and housing situation (Allemand & Hill, 2016). However, that same research found an almost zero association between age and dispositional gratitude. Additional work has supported this finding, showing a non-significant age association with gratitude at trait and daily levels (Allemand & Hill, 2019). That said, the literature is equivocal as some studies reported a modest positive association with age (Chopik et al., 2019).

To better understand age effects in dispositional gratitude, one possibility is to focus on the subjectivity of the aging process. We thus examined whether gratitude differ depending on age-related differences in future time perspective (FTP), which refers to the subjective perception of the future as either open-ended or as limited. FTP is couched within the socioemotional selectivity theory (Carstensen, Isaacowitz, &
Charles, 1999), which states that perceptions of the future have important implications for the selection of goals, preferences, and activities. When the future is perceived as open-ended or expansive, people are strongly motivated to optimize their future by focusing on the opportunities that lie ahead. People with an open-ended future perspective perceive the future in positive ways and direct their focus on the opportunities, plans, and goals they can pursue. Perceptions of the future as open-ended are associated with greater positive affect and life satisfaction and lower negative affect (Gruhn, Sharifian, & Chu, 2016; Katana, Hill, & Allemand, 2020). In contrast, when people view their future as limited, as is typical in older adulthood, the focus shifts from the optimization of future possibilities to the maximization of meaningful activities and experiences in the present by setting priorities and regulatory processes (Carstensen et al., 1999).

This work may hold particular importance for the study of dispositional gratitude, given that it is an emotional trait (McCullough et al., 2002) and has been described as a personality characteristic that promotes well-being (Wood, Froh, & Geraghty, 2010). Indeed, initial studies have shown that the associations between gratitude and perceptions of the future are much larger than those evidenced between the trait and age (Allemand & Hill, 2016, 2019). Put differently, people may be more grateful when they perceive an expansive future with full of opportunities.

1.2. Current study

In the current study, we examined age-related differences in the measurement, mean levels, variances, and correlations of dispositional gratitude and future time perspective (FTP). We used the well-established Gratitude Questionnaire-6 (GQ-6; McCullough et al., 2002) and the Future Time Perspective Scale (FTPS; Lang & Carstensen, 2002) to assess individual differences in dispositional gratitude and perceptions of the future. Both self-report measures were designed to assess unidimensional constructs. However, recent work suggests that FTP is multidimensional and can be conceptualized in terms of perceived remaining opportunities and perceived remaining time (Allemand & Hill, 2016; Cate & John, 2007; Zacher & Frese, 2009). A strong focus on remaining opportunities indicates that people perceive their future in positive ways and direct their focus on the options, plans, and goals they can still pursue in their remaining lifetime. A strong focus on remaining time refers to perceptions of the future in terms of time limits, restrictions, and boundaries that lie ahead.

To examine factor structures, means and correlations across continuous age, we employed local structural equation modeling (LSEM; Hildebrandt, Lüdtke, Robitzsch, Sommer, & Wilhelm, 2016; Olaru, Schroeders, Hartung, & Wilhelm, 2019). This approach helps to address concerns evident when gratitude and FTP assessments may mean something different across ages, without resorting to artificial age groupings. Moreover, we examined whether associations differed across remaining opportunities and remaining time. Building on initial evidence that the associations between gratitude and perceptions of the future may vary across age (Allemand & Hill, 2019), we tested for age-associated differences in the measurement and structure of these constructs.

2. Methods

2.1. Participants and procedure

Data came from MOSAiCH, which is a cross-sectional survey on values and attitudes toward a wide range of social issues (Ernst Staehli, S.APIN, Pollien, Ochsner, Nispe, & Joye, 2019). In 2018, 5983 individuals aged 18 years or older among the permanent resident population of Switzerland were randomly sampled, drawn on national level by the Swiss Federal Statistical Office from the SRPH (Population register). The survey had two parts, with only those participants who completed Part 1 being invited to Part 2. From the sampled individuals, 2350 adults (response rate = 39.4%) participated in Part 1 and 1774 (75.5% of Part 1 sample, 29.7% overall) participated in Part 2. Because the variables of interest were included in Part 2, we focused on this sample only (N = 1774). We excluded participants with missing age values (n = 14). Of the remaining 1760 participants (51.8% female), 1501 participants responded to all relevant variables for our analyses. In total, 2.7% of the questionnaire data were missing values. The mean age was 49.90 years (SD = 17.25, range: 19–98). With respect to the highest level of educational attainment, 1.2% reported having a primary education, 45.9% reported having a secondary education (e.g., vocational training, apprenticeship, general training school), 18.5% had a post-secondary double or upper vocational training, 32.3% had a university degree or equivalent, 2.1% reported “others” or provided no response.

2.2. Measures

2.2.1. Gratitude

The Gratitude Questionnaire-6 (GQ-6; McCullough et al., 2002) was used to assess the disposition to experience gratitude. Participants rated their level of agreement with six items (see Fig. 1 for items) using a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The GQ-6 has good psychometric properties, including a robust one-factor structure (McCullough et al., 2002) and good internal consistency (Card, 2019). Moreover, correlations in theoretically expected ways with a variety of affective, prosocial, and spiritual constructs provide support for its validity (McCullough et al., 2002). The alpha reliability for the GQ-6 in this study was 0.77.

2.2.2. Future time perspective

Six items from the 10-item Future Time Perspective Scale (FTPS; Lang & Carstensen, 2002) were used to assess perceived remaining opportunities and remaining time. Two-factor models with and without item restrictions were tested. The original FTPS model with a two-factor structure (FTP-T1 and FTP-T2; McCullough et al., 2002) provided the best fit. The one-factor model had a slightly better fit in the data used in the current study than the two-factor model. The item restrictions were included in the two-factor model.

![Fig. 1. Measurement Model with Standardized Parameters. Note. FTP-O1: “I feel that many opportunities await me in the future,” FTP-O2: “I expect that I will set many new goals in the future,” FTP-O3: “My future is filled with possibilities”; FTP-T1: “Most of my life lies ahead of me,” FTP-T2: “My future seems infinite to me,” FTP-T3: “As I get older, I begin to experience time in my future as limited” (reverse-coded); GQ1: “I have so much in life to be thankful for”; GQ2: “If I had to list everything that I felt grateful for, it would be a very long list”; GQ3: “When I look at the world, I don’t see much to be grateful for”; GQ4: “I am grateful for a wide variety of people”; GQ5: “As I get older I find myself more able to appreciate the people, events, and situations that have been part of my life history”; GQ6: “Long amounts of time can go by before I feel grateful to something or someone” (reverse-coded). Note that GQ3 and GQ6 were excluded, see Results section. Model fit: df = 32; χ² = 235.93; CFI = 0.973; RMSEA = 0.060; SRMR = 0.056.](image-url)
opportunities and perceived remaining time (Allemand & Hill, 2016; Zacher & Frese, 2009). Three items reflect perceived remaining opportunities and three items reflect perceived remaining time (see Fig. 1 for items). Participants rated their level of agreement with the items using a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate that the individual views the future as open-ended and with greater opportunities and more time in the future. Research demonstrated factorial validity for the two dimensions of FTP based on the six items (Allemand & Hill, 2016). The alpha reliabilities in this study were 0.89 (opportunities) and 0.66 (time).

2.3. Analytic strategy

2.3.1. Model specification

We estimated a correlated three-factor model (Fig. 1) using confirmatory factor analysis (CFA). We then compared this model to a two-factor model in which FTP was represented by a common factor based on a common factor analysis (CFA). We then compared this model to a two-factor model with separate FTP factors yielded a substantially better model fit (df = 51; χ² = 452.4; CFI = 0.949; RMSEA = 0.067; SRMR = 0.052). An examination of the modification indices showed that the two negatively-keyed gratitude items (items 3 and 6) yielded cross-loadings on the FTP factors (e.g., item 3: opportunities cross-λ = 0.27; time cross-λ = 0.22) that were comparable to the small main loadings of these two items (e.g., item 3: λ = 0.31). The other four gratitude items loaded on average by λ = 0.67 on the common factor. Excluding the two items increased model fit substantially (df = 32; χ² = 235.93; CFI = 0.973; RMSEA = 0.060; SRMR = 0.036) without compromising the measurement of gratitude (correlation between the full and modified gratitude factor scores: r = 0.99; p < .001).

As such, we used the modified model for the subsequent analyses (Fig. 1). Factor reliability McDonald’s ω (i.e., factor saturation) was adequate for the low number of items (gratitude: ω = 0.77; opportunities: ω = 0.90, time: ω = 0.70). Correlations of gratitude with opportunities and time were 0.45 and 0.29 (p < 0.001), respectively. The correlation between gratitude and opportunities was significantly higher than the correlation between gratitude and time (Δr = 0.16; p < .001; standard errors for the difference derived by bootstrapping the model). Opportunities and time were highly correlated (r = 0.81; p < .001), but as the comparison of the two to the three-factor model indicates, the constructs seem to be sufficiently distinct.

2.3.2. Testing age moderation effects using LSEM

We tested age moderation effects on factor means, variances and correlations using the non-parametric method local structural equation modeling (LSEM; Hildebrandt et al., 2016; Olaru et al., 2019) with the lsem::estimate-function in the R package lsem (Robitzsch, 2019). In contrast to multi-group confirmatory factor analysis (MGCFA), where models are estimated based on artificially created age groups, LSEM maintains the continuous nature of age by estimating the model on each age point based on weighted samples (Hildebrandt et al., 2016; Olaru et al., 2019). We estimated the model on each age point ranging from 25 to 75 years of age with a bandwidth parameter of h = 2. Because of the symmetrical weighting function (see Olaru et al., 2019) participants outside these age ranges are still included in the model estimation. Not estimating the models at the age extremes ensures that enough participants are available on both sides of the weighting function, so that the mean age of the weighted samples is not skewed toward the middle of the age distribution.

2.3.3. Testing measurement invariance across age

We used the joint estimation procedure to test for measurement invariance of model parameters across age (Robitzsch, 2019). Similar to MGCFA, different levels of measurement invariance are compared: A configural model without additional parameter constraints, a metric model with equal factor loadings, and a scalar measurement invariant model with equal factor loadings and item intercepts across age. Goodness-of-fit indices can be compared between the nested models to evaluate the increase in missfit due to the parameter constraints. A substantial increase in these indices between subsequently strict models (∆CFI > 0.01; ∆RMSEA > 0.015; ∆SRMR > 0.015; Cheung & Rensvold, 2002) would suggest that the parameters are not measurement invariant across age.

2.3.4. Testing age effects on means, variances, and correlations

Next, we examined age effects on the model parameters. We tested moderation effects for significance using a permutation based approach (Hildebrandt et al., 2016) that estimated the LSEMs based on 1000 copies of the dataset in which the moderator values (i.e., age) are randomly reassigned to cases. The actual LSEM parameter estimates are then compared to this distribution of permutation parameter values to obtain significance values.

3. Results

3.1. Measurement model

Descriptive statistics and correlations for all items and age are presented in Table 1. The two-factor model with a common FTP factor and a gratitude factor did not fit the data well (df = 53; χ² = 733.58; CFI = 0.914; RMSEA = 0.085; SRMR = 0.059). A three-factor model with separate FTP factors yielded a substantially better model fit (df = 51; χ² = 452.4; CFI = 0.949; RMSEA = 0.067; SRMR = 0.052). An examination of the modification indices showed that the two negatively-keyed gratitude items (items 3 and 6) yielded cross-loadings on the FTP factors (e.g., item 3: opportunities cross-λ = 0.27; time cross-λ = 0.22) that were comparable to the small main loadings of these two items (e.g., item 3: λ = 0.31). The other four gratitude items loaded on average by λ = 0.67 on the common factor. Excluding the two items increased model fit substantially (df = 32; χ² = 235.93; CFI = 0.973; RMSEA = 0.060; SRMR = 0.036) without compromising the measurement of gratitude (correlation between the full and modified gratitude factor scores: r = 0.99; p < .001).

As such, we used the modified model for the subsequent analyses (Fig. 1). Factor reliability McDonald’s ω (i.e., factor saturation) was adequate for the low number of items (gratitude: ω = 0.77; opportunities: ω = 0.90, time: ω = 0.70). Correlations of gratitude with opportunities and time were 0.45 and 0.29 (p < 0.001), respectively. The correlation between gratitude and opportunities was significantly higher than the correlation between gratitude and time (Δr = 0.16; p < .001; standard errors for the difference derived by bootstrapping the model). Opportunities and time were highly correlated (r = 0.81; p < .001), but as the comparison of the two to the three-factor model indicates, the constructs seem to be sufficiently distinct.

3.2. Measurement invariance across age

The average weighted sample size across the LSEMs estimated at each age was N_eff = 541.7, ranging from N_g = 346.0 (age point 75) to N_eff = 640.7 (age point 52). The joint estimation procedure yielded a CFI = 0.969, RMSEA = 0.062, and SRMR = 0.043 in the configural model. The metric model yielded a CFI = 0.969, RMSEA = 0.056, and SRMR = 0.047, supporting measurement equivalence of the factor loadings across age. For the scalar measurement invariance model, model fit decreased to CFI = 0.951, RMSEA = 0.065, and SRMR = 0.060, suggesting that the item intercepts were not measurement invariant across age (∆CFI > 0.01). Inspection of the unconstrained item intercepts showed that this issue was related to the time items (Fig. 2).

The time factor scores decreased substantially across age (Fig. 3), and much more so for the first item (Fig. 2), as indicated by the decreasing item intercept across age. In contrast, the intercept of the second item increased across age (Fig. 2; see also differences in the correlations with age between these two items in Table 1). This does not mean that agreement to the second item increased across age (see negative correlation with age in Table 1), but that compared to the mean of the underlying time factor, this item mean decreased less across age. When the intercepts for the time items were freed across age, model fit of the scalar model increases to CFI = 0.967, RMSEA = 0.054, and SRMR = 0.049, which is equivalent to the metric model. This supports the assumption that the lack of measurement invariance was related to the items of the time scale, whereas the other two factors were scalar measurement invariant. We freed all time item intercepts because constraining only one or two would have aligned the factor mean with the arbitrarily
chosen item mean-level pattern, whereas freeing all provides a weighted (by the factor loadings) average of all three item patterns due to the effects coding factor identification used.

3.3. Age effects on factor means, variances and correlations

Across age, the factor mean for gratitude remained stable, whereas opportunities and time showed a strong linear decrease from 25 to 75 years of age, around a full standard deviation (opportunities: 0.45 to –0.57; time: 0.50 to –0.56; ps < 0.001) (Fig. 3). Because of the aforementioned issues with the measurement invariance of the time item intercepts, the actual values of the time factor should be interpreted with caution and only represent an approximation of the underlying trend. Again, item responses to all items of the time scale decreased with age, albeit to varying degrees.

Factor variances were on average 0.46 for gratitude, 0.60 for

| Variable     | M    | SD   | GQ1  | GQ2  | GQ3  | GQ4  | GQ5  | GQ6  | FTP-O1 | FTP-O2 | FTP-O3 | FTP-T1 | FTP-T2 | FTP-T3 |
|--------------|------|------|------|------|------|------|------|------|--------|--------|--------|--------|--------|--------|
| GQ1          | 4.40 | 0.63 |      |      |      |      |      |      |        |        |        |        |        |        |
| GQ2          | 4.10 | 0.75 | 0.65**|      |      |      |      |      |        |        |        |        |        |        |
| GQ3          | 3.54 | 1.04 | 0.22**| 0.21**|      |      |      |      |        |        |        |        |        |        |
| GQ4          | 3.95 | 0.76 | 0.39**| 0.49**| 0.18**|      |      |      |        |        |        |        |        |        |
| GQ5          | 4.13 | 0.71 | 0.35**| 0.39**| 0.15**| 0.43**|      |      |        |        |        |        |        |        |
| GQ6          | 3.37 | 0.99 | 0.15**| 0.19**| 0.25**| 0.21**| 0.12**|      |        |        |        |        |        |        |
| FTP-O1       | 4.99 | 1.58 | 0.33**| 0.34**| 0.3**| 0.27**| 0.23**| 0.11**|        |        |        |        |        |        |
| FTP-O2       | 4.60 | 1.65 | 0.24**| 0.29**| 0.28**| 0.25**| 0.21**| 0.13**| 0.67**|        |        |        |        |        |
| FTP-O3       | 4.85 | 1.69 | 0.31**| 0.33**| 0.31**| 0.26**| 0.23**| 0.16**| 0.78**| 0.76**|        |        |        |        |
| FTP-T1       | 4.13 | 1.92 | 0.14**| 0.17**| 0.23**| 0.14**| 0.14**| 0.02**| 0.53**| 0.63**|        |        |        |        |
| FTP-T2       | 3.44 | 1.77 | 0.19**| 0.24**| 0.19**| 0.19**| 0.21**| 0.04**| 0.53**| 0.59**| 0.64**|        |        |        |
| FTP-T3       | 3.02 | 1.72 | –0.01| –0.01| 0.07**| 0.01| 0.01| 0.04**| 0.14**| 0.11**| 0.15**| 0.27**| 0.27**| 0.27**|
| Age          | 49.90| 17.25| –0.05*| –0.01| –0.23**| 0.04| 0.05*| 0.02| –0.36**| –0.42**| –0.44**| –0.69**| –0.42**| –0.55**|

Note. M = mean; SD = standard deviation; GQ = gratitude questionnaire (items 1 to 6; item 3 and 6 were reverse coded); FTP-O = future time perspective – remaining opportunities (item 1 to 3); FTP-T = future time perspective – remaining time (items 1 to 3; item 3 was reverse coded).

* Indicates $p < .05$.
** Indicates $p < .01$.
opportunities, and 0.27 for time. For gratitude, the factor variance did not change substantially across age (Fig. 4). In contrast, the factor variances of opportunities and time increased from 0.44 to 0.77 and 0.17 to 0.34 (ps < 0.001) across the 50 years of age, respectively. This suggests that younger participants have a more similar (less variable across individuals) perception of the future, whereas older respondents differ more strongly in this regard.

Fig. 5 shows the moderating effect of age on the factor correlations. Generally, the correlations between the factors decreased across age. Most notably, the correlation between gratitude and the future time perspective factors decreased from 0.58 to 0.45 (opportunities) and 0.49 to 0.30 (time) and across the 50 years of age. However, these effects were not significant, which is also indicated by the large confidence intervals around the parameter estimates.

4. Discussion

This study provides multiple advances regarding age-related psychometrics and differences in gratitude and future time perspective across adulthood. First, the results support the modeled three-factor structure. In these analyses, we excluded two negatively scored gratitude items due to low main loadings and problematic cross-loadings. Despite the potential benefits of negatively scored items to interrupt response sets and discourage acquiescent answering, it is well-known that several problems may result from reversed coding (Weijters, Baumgartner, & Schillevaet, 2013). The modified measurement model showed a good model fit and the exclusion of the two items did not compromise the measurement of gratitude. Moreover, our findings support the distinction of FTP into opportunities and time (Allemand & Hill, 2016; Cate & John, 2007).

Second, we tested measurement invariance of the three scales across age. Whereas initial work reported measurement invariance of FTP measures across different age groups (Brothers, Chui, & Diehl, 2014; Rohr, John, Fung, & Lang, 2017), we made use of the LSEM to examine the moderating effect of age as a continuous variable on all parameters of the measurement model. We found that metric measurement invariance did hold, ensuring that comparisons of factor variances and covariances across age can be made. Scalar measurement invariance was supported for the gratitude and opportunities scales, but not for the time scale. Even though the time factor decreased across age, it did so at different rates depending on the items. Two items in particular showed differential item functioning (see also Rohr et al., 2017). As such, despite having similar scores on time, people may respond differently to the three items depending on their age. It is possible that people may understand the meaning of these items in a qualitatively different way as a function of age, an assumption that should be tested in future research. Since scalar measurement invariance represents a requirement for valid group comparisons of factor means, the mean-level age variations in the time factor should be interpreted with caution due to lack of scalar invariance.

Third, we systematically tested for age effects on means, variances and correlations between constructs. Regarding mean-levels, we did not find age differences in gratitude. This finding supports previous research showing a lack of age trends for gratitude (Allemand & Hill, 2016, 2019). In contrast, we found strong linear decreases across age in the two dimensions of FTP. The results indicate that younger people tend to perceive the future as expansive and full of opportunities, whereas older people tend to see the future as limited and with restrictions and boundaries that lie in the time ahead. As noted earlier, the age trajectory of time should be interpreted with caution due to lack of scalar measurement invariance.

The study of age differences in variances in personality characteristics has received little attention (Allemand, Zimprich, & Hendriks, 2008; Mõttus, Allik, Hrebíčková, Kööts-Ausmees, & Realo, 2016). Based on metric measurement invariance, we found that factor variance in gratitude was not affected by age, but the amount of interindividual differences increased for both FTP components across age. The perceptions of the future were less homogeneous in older than in younger adulthood, suggesting “age-related heterogeneity” (Dannefer, 1988). There are several reasons for increasing interindividual differences in FTP with age. For example, the cumulative effects of people’s unique experiences might have produced increasing differences in how they perceive their future. Moreover, somewhat freed from societal constraints, older adults may be more able to choose their own courses of action and take advantage of opportunities to shape their lives.

Fourth, the correlational findings again point to the need to include subjective conceptualizations of the aging process in addition to chronological age (Carstensen et al., 1999). Indeed, results indicate that the associations between gratitude and the dimensions of FTP did not vary as a function of age, and we found no indication of any practically important age differences in the associations between constructs, similar to findings of structural stability in personality traits (Allemand et al., 2008; Zimprich, Allemand, & Lachman, 2012). Regardless of age, a focus on opportunities and expansive time remaining can help to see the good things in life such as social partners and to experience gratitude. Future research may wish to consider whether manipulating time perspective leads people to choose those partners for which they are more grateful, one possible mechanism underlying these findings.

However, it is interesting to note that recent micro-longitudinal research reported age effects on the associations between average daily scores of gratitude and FTP (Allemand & Hill, 2019). This discrepancy points to the nuanced role for age in gratitude research depending on how gratitude is conceptualized and measured; specifically, the current work examined gratitude as a dispositional trait rather than an average of daily accounts, the latter may be more proximal rather than generalized in nature. Not only do associations with age

Fig. 4. Factor Variance Across Age. Note. The dark points represent point estimates at each age point. The dashed black line shows a linear approximation. Dashed grey lines represent the 95%-confidence interval for each point estimate.
differ depending on the measurement approach, but even the extent to which age moderates the associations between gratitude and psychosocial constructs may change based on the conceptualization. Future research is needed to further investigate the role of age on these associations, particularly with a consideration of gratitude at different levels of measurement.

4.1. Limitations and future directions

The current study is not without limitations that should guide future research. First, we used six items from the 10-item FTPS (Lang & Carstensen, 2002). Recently, researchers have proposed three dimensions of FTP (opportunity, extension, and constraint; Rohr et al., 2017). Future research with the longer measure is needed to replicate the current findings. Second, given the subjective nature of FTP, the results of the current study were based on self-reports only. Future studies should enrich self-report data with observer reports by close informants (e.g., friends and family members) and behavioral measures. Third, the current sample was restricted to a single country and was largely homogenous in terms of cultural identity. As such, future research needs to examine whether findings generalize to other contexts, particularly ones with different attitudes on aging. Fourth, the cross-sectional design of the study demands caution in the interpretation of the results. However, our results with respect to the gratitude and FTP associations are comparable to findings of recent micro-longitudinal studies (Allemand & Hill, 2019; Katana et al., 2020), and extended this literature by demonstrating that, with an exception, the measures of gratitude and future time perspective function equivalently across continuous age. Finally, the current work focused on perceptions of the future as one indicator of subjective aging. An avenue for future studies is to include other markers of subjective aging, such as the age that an individual feels (Stephan, Sutin, & Terracciano, 2015) or perceived physical condition.

5. Conclusion

The current study reported extensive analyses of age-related psychometrics and differences in gratitude and future time perspective across adulthood. We used LSEM to maintain the continuous nature of age instead of artificially dividing participants into age groups. The broader picture that emerged from the current study is one of both stability and age differences in FTP and gratitude with respect to factor means, variances and correlations across age. In summary, age effects in gratitude were more likely to occur for subjective age in terms of perceived future time than chronological age.

Data source acknowledgement

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CRediT authorship contribution statement

Mathias Allemand: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. Gabriel Olaru: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Formal analysis, Visualization. Patrick L. Hill: Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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