Sociohistorical Change in Urban Older Adults' Perceived Speed of Time and Time Pressure

Online Supplemental Material

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1. Description of Source Samples

Berlin Aging Study (BASE). Participants (*N* = 516) residing in districts of former West Berlin were identified through random draws from records in the obligatory city registry and were examined between 1990 and 1993. With the exception of the geriatric medicine evaluations that were conducted at university hospitals, all testing was conducted in individual face-to-face sessions at participants' residences (i.e., private household or institution) by trained research assistants and medical personnel. Sessions were typically completed in about 90 minutes and, when necessary, were split into shorter units of assessment. For further details on the BASE see Baltes and Mayer (1999).

Berlin Aging Study II (BASE-II). Participants (*N* = 1,600 older adults and *N* = 600 younger adults) were recruited and tested between 2009 and 2018 from the greater metropolitan area of Berlin through an existing participant pool at the Max Planck Institute for Human Development and public advertisements. The self-report measures used in the present study were obtained via take-home questionnaires in 2013/14 (well-being, loneliness) and mailed questionnaires in 2017/18 (time perception). Cognitive testing was conducted in 2013/14 in the lab in small group sessions by trained interviewers (Düzel et al., 2016) and grip strength was assessed at the Charité - Universitätsmedizin Berlin hospital as part of a two-day medical assessment in 2010-14 (König et al., 2018). For further details on the BASE-II see Bertram et al., (2014) and Gerstorf et al. (2016).

Note that the BASE was selectively drawn from former West Berlin whereas the BASE-II was drawn from the full metropolitan area. In supplemental analyses where participants who had previously resided in former East Germany (German Democratic Republic, GDR) were excluded, the pattern of results was the same (see Supplement 5).

2. Propensity Score Matching

To equate the cohort samples on age and education, we used a propensity score matching approach (Coffman, 2011; Foster, 2010; McCaffrey et al., 2004; Thoemmes & Kim, 2011) to identify for each BASE participant ($N = 516$) a corresponding participant from the older cohort of the BASE-II ($N = 1{,}600$) who matched them as closely as possible with respect to age and education. Following the extant literature (e.g., Rosenbaum & Rubin, 1985) the propensity score was logit-transformed to calculate a between-group distance matrix. Nearest neighbors were matched with a caliper matching algorithm. We increased the caliper (maximum allowable distance between matched participants) continuously by increments of 0.01 until cohort effects in age and education no longer differed from 0 at $p < .05$. Each participant in BASE was allocated the nearest neighbor from BASE-II only if the neighbor fell within the caliper distance. At a caliper size of $c = 0.18$ *SD*, the matched BASE and BASE-II cohorts did no longer differ significantly in age and education. A suitable neighbor in BASE-II could be identified for 248/256 BASE participants. Table 1 in the main paper shows the resulting age and education distribution for each of the matched cohorts documenting the success of the matching approach.

Note that the matching effort significantly decreased the age range, which varied considerably between BASE and BASE II (70–103 vs. 61–88 years), to arrive at a common range of 70 to 92 years in the matched samples. Additional individual difference characteristics (e.g., loneliness) could have been included in the matching procedure, but would have further limited sample size and decreased statistical power.

3. Table

Results of Nested Model Comparisons that allow for increasing Cohort Group-Specificity when not including those BASE-II participants who had resided at least for one year in the former GDR prior to 1989

	Goodness-of-fit indices				
Model	χ^2 (*df*)	$\Delta\ \chi^2$ (*df*)	RMSEA	AIC	CFI
Zero-order models					
M1: Invariance	31.33 (5)	– –	0.161	2,193.35	0.282
M2: means time perceptions allowed to vary	19.84 (3)	–11.49 (2) *	0.166	2,185.86	0.540
M3: (co)variances time perceptions allowed to vary	0.00 (0)	–19.84 (3) *	0.000	2,172.02	1.000
Correlates included					
M1: invariance	37.02 (19)	– –	0.068	10,275.10	0.670
M2: means time perceptions allowed to vary	28.00 (17)	–9.02 (2) *	0.056	10,270.09	0.799
M3: (co)variances time perceptions allowed to vary	11.06 (14)	–16.94 (3) *	0.000	10,259.14	1.000
M4: prediction allowed to vary	0.00 (0)	–11.06 (14)	0.000	10,276.08	1.000

Note. M = model. Means and variances of and covariances among the correlates were estimated freely across groups. The standardized mean difference in time pressure between BASE and BASE-II amounted to about one third of a *SD* unit (*M* = 0.32 in the zero-order model and *M* = 0.38 in the model with correlates). Individual differences in perceived speed were more than one third larger in the early 1990s (at the zero-order level, 1.00) than in the late-2010s (at the zero-order level, 0.54).

* $p < .05$.

4. Time Perception Scales

The scales were developed for the BASE and were first reported by Staudinger et al. (1999).

Perceived speed of time was measured using three items that participants answered using a three-point scale: “How fast does time go by for you?”, responded to with 1 = *fast*, 2 = *in-between*, and 3 = *slow*; “How does this compare to when you were younger (young adulthood, between 30-50 years old)?”, responded to with 1 = *faster*, 2 = *unchanged*, and 3 = *slower*; and “Does time for you go by …”, responded to with 1 = *too fast*, 2 = *just right*, and 3 = *too slowly*.”

Perceived time pressure was also measured with three items and a three-point scale: “How much time do you have? Is it …”, responded to with 1 = *a lot*, 2 = *an average amount*, and 3 = *little*; “How does this compare to when you were younger (young adulthood, between 30-50 years old)? Is it …”, responded to with 1 = *more now*, 2 = *about the same*, and 3 = *less now*; and “Do you feel that you have … 1 = *too much time*, 2 = *just the right amount of time*, and 3 = *too little time*.”

Some studies suggest that assessments of time perception that involve comparisons with the distant past are more likely to yield age effects (e.g., Janssen et al., 2013) Here, however, the pattern of results was comparable when excluding the items in each scale that prompted comparisons with younger adulthood (see Supplement 5).

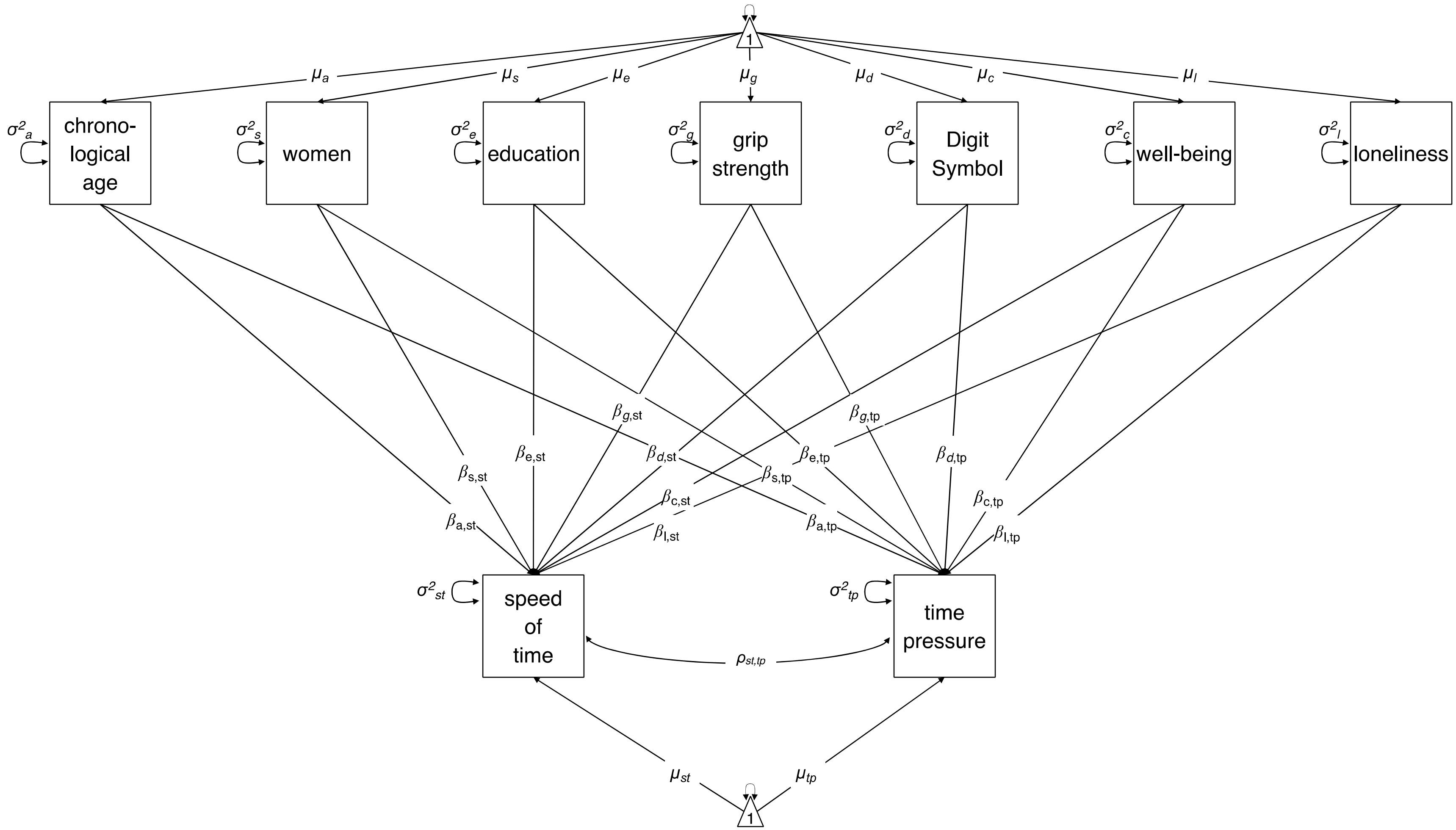
5. Table

Results of Nested Model Comparisons that allow for increasing Cohort Group-Specificity when not including those items that ask about comparisons with young adulthood

	Goodness-of-fit indices				
Model	χ^2 (*df*)	$\Delta\ \chi^2$ (*df*)	RMSEA	AIC	CFI
Zero-order models					
M1: Invariance	23.19 (5)	– –	0.120	2,695.21	0.725
M2: means time perceptions allowed to vary	10.40 (3)	–12.79 (2) *	0.099	2,686.42	0.888
M3: (co)variances time perceptions allowed to vary	0.00 (0)	–10.40 (3) *	0.000	2,682.02	1.000
Correlates included					
M1: invariance	38.18 (19)	– –	0.063	12,590.14	0.816
M2: means time perceptions allowed to vary	23.17 (17)	–15.01 (2) *	0.038	12,579.13	0.941
M3: (co)variances time perceptions allowed to vary	13.17 (14)	–10.00 (3) *	0.000	12,575.14	1.000
M4: prediction allowed to vary	0.00 (0)	–13.17 (14)	0.000	12,589.98	1.000

Note. M = model. Means and variances of and covariances among the correlates were estimated freely across groups. The standardized mean difference in time pressure between BASE and BASE-II amounted to about one third of a SD unit (M = 0.30 in the zero-order model and M = 0.32 in the model with correlates). Individual differences in perceived speed were about one third larger in the early 1990s (at the zero-order level, = 1.00) than in the late-2010s (at the zero-order level, 0.62).

* $p < .05$.



6. Invariance model (M1). *Set-up of a model that does not allow for any form of cohort group specificity; one set of parameters is used to describe the full sample.*

7. Follow-up Analyses

Variable Skewness

In a series of follow-up analyses, we explored the robustness of the findings with respect to the (mis)treatment of the highly skewed variables as normal under the full-information maximum likelihood (FIML) approach employed in the primary analyses. To this end, each set of models were reconstructed in estimation frameworks (variants of weighted least squares) that could accommodate non-normal outcome variables. Specifically, we explored the following approaches: 1) we recoded the outcomes into binary variables (using both median and 75th percentile splits), 2) we recoded the outcomes into ordered categorical variables with estimated thresholds, 3) we explicitly treated the variable as skewed. Results across models were quite consistent and provided for very similar (or similarly ambiguous) inferences. This highlights the need for future research that employs revised measures that avoid ceiling effects.

Non-Linear Associations

Another series of follow-up analyses tested for quadratic associations between the variables of interest. Following the logic of our models, we started with models that included linear and quadratic terms for either of the two health and cognitive variables (grip strength and Digit Symbol). In separate models we also included main and interaction effects of these with the cohort variables. Following an anonymous peer reviewer's suggestions, we also estimated analogue models that reversed the order of predictor and outcome (i.e., linear and quadratic terms of time pressure as predictors of health and cognition). Consistent across all of these follow-up analyses, no evidence whatsoever was obtained for quadratic associations among the variables examined or cohort differences therein.

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