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Civic Competencies During Adolescence: Longitudinal Associations with Sympathy in Childhood

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Supplemental Materials for:

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Online Appendix S0

Attrition and Missing Data Analysis

Out of the 1118 children of the COCON child cohort (www.cocon.uzh.ch) interviewed at the first measurement time relevant for this study (i.e., age 9), 71% ($n = 792$) remained in the sample until the fourth wave, nine years later (i.e., age 18). In order to examine whether there was a systematic pattern in the sample attrition, the MCAR (missing completely at random) test by Little (1988) was conducted. Since this test was significant, it could not be assumed that the missingness was completely at random. Thus, the next step was to analyze whether descriptive variables accounted for some of the missingness by using a binary logistic regression model predicting study attrition by including parental education, migration background of the child, and sex of the child as predictor variables. The results showed that children from parents with higher parental education (odds ratio = 0.68, $p = .008$) and children without a migration background (odds ratio = 0.51, $p < .001$) were significantly more likely to remain in the study than children from parents with lower education and migration background. Therefore, it was concluded that Missing at Random (MAR; i.e., the missingness was related to observed variables) was supported (see Enders, 2010 for an in depth discussion) and missing data was accounted for by using full maximum-likelihood estimation (method: FIML) in *Mplus 8.2* (Muthén & Muthén, 2018). FIML results in unbiased parameter estimates under the assumption of MAR, particularly when the variables predicting study attrition are included in model estimation, since all information is used to inform parameter values and standard errors (Enders, 2010).

Independent variable: Sympathy (additional information)

The sympathy scale (Zhou, Valiente, & Eisenberg, 2003) consisted of the following items: “I feel sorry for children who cannot afford many things”, “I feel sorry for children who are being bullied”, “I feel sorry for children who feel sad or are in troubles”, “When I

see another child who is hurt or upset, I feel sorry for them.”, “I feel sorry for children who do not have any toys.”. At T2 (i.e., age 12), the last statement about toys was replaced with the statement “I do not have any compassion for children who are being bullied.” (statement was recoded) in order to adopt for age-specific changes. This was accounted for in the measurement model.

Dependent variables: Dimensions of civic competencies (additional information)

Attitudes about social justice were assessed by the following five items: “Wealth should be divided equally world-wide, even if I need to abstain from certain luxury goods.”, “It is an important task of the government to support people in need, such as people with disabilities or unemployed people.”, “It is important to reduce social inequalities.”, “It is important to be fair to others.”, “It is important to treat everybody equally.”(Gille, Sardei-Biermann, Gaiser, & Rijke, 2006; Grob & Merki, 2001). All items, except for the last three items in the attitudes about social justice scales were rated on a six-point scale (1 = totally disagree, 6 = totally agree). These three items were standardized from their original scale of 1-10 (1 = not important at all, 10 = extremely important) to range from 1 to 6 in order to have all variables on the same metric (Little, 2013).

Informal helping was operationalized with five items slightly adapted from Goodman, (1997): “I often volunteer to help others (parents, teachers, and children).”, “I usually share with others.”, “I am kind to younger children.”, “I am considerate of other people’s feelings.”, “I help if someone is hurt, upset or feeling ill.”.

Perceived efficacy to take responsibility was measured with two items (Grob & Merki, 2001): “I am usually able to take responsibility for a certain task.”, “I enjoy taking over responsibilities for different tasks.”.

Political efficacy beliefs were operationalized with the following three items (Baumert, Gruehn, Heyn, Köller, & Schnabel, 1997): “If things should change, one needs to

personally act, rather than relying on politics.”, “If you disagree with politics, one has to become personally active.”, “Just talking about politics is useless, one also needs to act.”.

Online Appendix S1

Longitudinal Measurement Invariance

In order to establish MI of all our instruments over time, a set of confirmatory factor analyses was conducted for each construct. In a first step, the measurement model for each construct was identified. In order to have just-identified models (i.e., a balance of known and unknown model parameters, referring to the number of estimated parameters and the number of observed unique variances, covariances, and means, Little, 2013), each latent construct was specified by three indicators (with the exception of perceived ability to take responsibility that was measured by two items). This strategy reduces an arbitrary improvement of model-fit that could stem from using over-identified constructs. This means that for the latent constructs of attitudes about social justice and informal helping measured by five items, four items were parceled (i.e., averaged) with a balancing approach, whereby the item with the highest item-scale correlation was averaged with the item that had the lowest-item scale correlation, followed by averaging the second highest and second lowest item (Little, 2013). Since the items were measured at different time points, the parceling approach was based on the loadings of the items of all waves available. For the under-identified construct efficacy to take responsibility with two indicators, the factor loadings were constrained to be equal in order to identify the construct. To set the scale of the latent constructs, the fixed factor method was used, whereby the variance of the latent factor is fixed to 1 establishing a standardized metric of the latent components relative to the construct variance. Moreover, the latent mean is fixed to 0; thus, latent means and variances of the later

measurement times are identified and scaled relative to the mean and variance of the first measurement time (Little, Slegers, & Card, 2006).

After identifying the measurement model for each variable, a stepwise approach was conducted to test for MI. The first step in testing MI was to have a configural model, in which the same pattern of fixed and free factor loadings of each latent construct is specified across time (Steenkamp & Baumgartner, 1998). The second step was to establish metric invariance, whereby the factor loadings of all indicators are constrained to be equal over time (e.g., λ_1 at T1 = λ_1 at T2 = λ_1 at T3 = λ_1 at T4); and the third step is to examine scalar invariance, where all indicator intercepts (i.e., means) are constrained to be equal over time (e.g., τ_1 at T1 = τ_1 at T2 = τ_1 at T3 = τ_1 at T4). The interpretation of scalar invariance is that the mean differences in the items across time are due to mean differences in their respective latent factors. Since mean-level changes were the focus in this study, scalar invariance was a requirement to reliably compare mean-scores across time (Widaman, Ferrer, & Conger, 2010). For each construct, differences among configural, metric, and scalar MI were examined by calculating the $\Delta\chi^2$ test using the Satorra-Bentler scaled method (Satorra & Bentler, 2010) and Δ CFI tests of the respective nested models. Since the $\Delta\chi^2$ test is sensitive to sample size and minor model misspecifications, Δ CFI was considered with a threshold of .01. If Δ CFI \leq .01, whereby the observed decrease in fit can be attributed to sampling error rather than a lack of equivalence (Cheung & Rensvold, 2002).

Table S2 reveals that for all scales, except for sympathy, the criteria for scalar invariance were met. For sympathy, partial scalar invariance was met. This means that one or more of the intercepts could not be constrained to equality over time (Cheung & Rensvold, 2002). In this case, modification indices were used to identify sources of differences, and the respective indicator(s) that were not invariant over time was / were kept in the model, but the constraints was / were relaxed for this / these indicator(s) (Little, 2013). Since the sympathy

scale at T1 (i.e., age 9) was slightly different from the other waves, the factor loadings for the item parcel containing these two items were not equated over all for time points, but only for T2-T4 (i.e., T2 = age 12, T3 = age 15, and T4 = age 18). With regards to the mean structures of the latent sympathy variables, all means were equated over T3 and T4; however, only the mean of one parcel was equated over all four waves. Across time, all indicators showed positive and statistically significant factor loadings on their intended latent factor (see Table S5).

Table S1
Longitudinal Measurement Invariance

	χ^2	df	<i>p</i>	CFI	MC	S-B $\Delta \chi^2$	Δ df	<i>p</i>	Δ CFI
Sympathy (T1, T2, T3 & T4)									
1. Configural	52.53	33	.017	0.991					
2. Metric	64.06	38	.005	0.989	2 vs. 1	11.40	5	.044	0.002
3. Scalar	627.35	44	<.001	0.744	3 vs. 2	630.30	6	<.001	0.245
4. Partial scalar	68.78	39	.002	0.987	4 vs. 2	4.74	1	.029	0.002
Attitudes about social justice (T3 & T4)									
1. Configural	11.46	5	.043	0.987					
2. Metric	17.74	7	.013	0.979	2 vs. 1	7.89	2	.019	0.008
3. Scalar	22.27	9	.008	0.974	3 vs. 2	4.72	2	.095	0.005
Informal helping (T3 & T4)									
1. Configural	16.84	5	.004	0.982					
2. Metric	18.01	7	.012	0.983	2 vs. 1	2.08	2	.354	-0.001
3. Scalar	24.84	9	.003	0.976	3 vs. 2	6.99	2	.030	0.007
Efficacy to take responsibility (T3 & T4)									
1. Configural	0.39	1	0.535	1.000					
2. Metric	0.39	1	0.535	1.000	2 vs. 1	0	0	>.05	0.000
3. Scalar	5.71	2	0.058	0.995	3 vs. 2	5.30	1	.021	0.005
Political efficacy beliefs (T3 & T4)									
1. Configural	4.23	5	.517	1.000					
2. Metric	6.02	7	.537	1.000	2 vs. 1	1.79	2	.410	0.000
3. Scalar	10.83	9	.289	0.992	3 vs. 2	5.32	2	.070	0.008

Table S2

Correlations of the latent variables of civic competencies at T3 and T4 for the model with correlated unidimensional factors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. ASJ T3							
2. IH T3	.73***						
3. ETR T3	.26***	.36***					
4. PE T3	.46***	.31***	.22**				
5. ASJ T4	.61***	.45***	.15**	.26***			
6. IH T4	.45***	.61***	.28***	.21**	.55***		
7. ETR T4	.16**	.27***	.58***	.18**	.08†	.36***	
8. PE T4	.31***	.16*	.10	.65***	.42***	.26**	.26***

Note. ASJ = Attitudes about social justice. IH = Informal helping. ETR = Efficacy to take responsibility. PE = Political efficacy beliefs. T3 = third measurement time, T4 = fourth measurement time.

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

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