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Supplement to the publication: Perceived stress and coping among adults in Germany: results from the *Health in Germany* panel 2024

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Additional information on 2.2 Variables

In the future, short versions of the PSS-10 and SACS-16 are to be used in the *Health in Germany* panel: the PSS-2&2 and the SACS-8.
The PSS-2&2 has a two-factorial structure: items 1 and 9 from the PSS-10 are included for the factor *perceived helplessness*, and items 4 and 5 for *perceived self-efficacy* [1]. The PSS-2&2 was used instead of the PSS-4 [2] as the one-factorial structure of the PSS-4 repeatedly could not be replicated [1]. The PSS-2&2 was found to be reliable and valid in a sample representative of Germany [3].

The short form SACS-8 can be derived from the SACS-16 and provides an economical assessment of four coping strategies, with only two items each: *active coping* (one item on *coping flexibility*, one item on *perseverance*), *instrumental support*, *repression*, and *wishful thinking*. Model fit and measurement invariance were also found to be suitable for the SACS-8 [4].

Additional information on 2.3 Statistical methods – instrument testing

To validate the instruments used, the prerequisites for scale construction of the variables *perceived stress* and *coping* were examined. In addition to validating the long instruments PSS-10 and SACS-16, their short scales, PSS-2&2 and SACS-8, were also examined, as these are intended to be used for future surveillance purposes. This was done using confirmatory factor analyses with the R package *lavaan.* For the PSS-10, a bifactorial model (one general G factor and two subfactors), a model with two correlated latent factors, and a one-factorial model were tested. For the SACS-16, a model with eight correlated latent factors and a one-factorial model were tested. For the PSS-2&2, a two-factorial and a one-factorial model were tested, and for the SACS-8, a four-factorial and a one-factorial model were tested. Model fit was assessed using the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), with values > 0.90 indicating good model fit, as well as the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR), with values < 0.08 indicating acceptable fit [5]. To determine reliability (internal consistency), the omega coefficient was calculated using the *semTools* package. An omega value > 0.70 is considered acceptable [6]. This threshold was used for the evaluation of the PSS-10. Because the individual scales of the PSS-2&2, SACS-16, and SACS-8 each comprise only two items, an omega value > 0.60 was considered appropriate for evaluating reliability in these particularly short instruments [6].

To ensure that the instruments for *stress* and *coping* measure the same construct with the same meaning across different groups (by age group, gender, and education), measurement invariance analyses were also conducted using the *semTools* package. A ΔCFI-Wert < 0.01 was accepted as an indicator of configural measurement invariance [7].

Additional information on 3. Results – instrument testing

The confirmatory factor analyses for the PSS-10 confirmed the bifactorial model (with the factors *perceived helplessness* and *perceived self-efficacy*) and the correlated two-factorial model for the PSS-2&2 (see Tables 1 and 2), as well as the correlated eight-factorial model for the SACS-16 and the correlated four-factorial model for the SACS-8 (see Tables 3 and 4). Across gender, age, and education groups, scalar measurement invariance, and in some exceptional cases partial scalar measurement invariance, could be demonstrated for all four instruments (age groups for SACS-16/-8 and PSS-10, with a difference Δ in CFI just above |.10|; see Tables 5–8). The omega coefficient for determining reliability ranged between 0.721 and 0.877 for the long and short versions of the PSS (see Table 9), and between 0.636 and 0.832 for the long and short versions of the SACS, with the exception of the factor *repression*, which had an omega of 0.28 (see Table 10).

Table 1: Results of the confirmatory factor analysis for the PSS-10

	rCFI	rTLI	rRMSEA	rRMSEA 95%CI	SRMR
Bifactorial	**0.980**	**0.963**	**0.069**	**0.670-0.720**	**0.018**
Two-factorial	0.957	0.943	0.076	0.074-0.078	0.041
One-factorial	0.884	0.850	0.123	0.121-0.125	0.068

Source: RKI-Panel 2024

rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual; bold: model with the best fit

Table 2: Results of the confirmatory factor analysis for the PSS-2&2

	rCFI	rTLI	rRMSEA	rRMSEA 95%CI	SRMR
Two-factorial	**0.992**	**0.955**	**0.075**	**0.065-0.086**	**0.012**
One-factorial	0.852	0.557	0.249	0.242-0.257	0.080

Source: RKI-Panel 2024

rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual; bold: model with the best fit

Table 3: Results of the confirmatory factor analysis for the SACS-16

	rCFI	rTLI	rRMSEA	rRMSEA 95%CI	SRMR
Eight-factorial	**0.965**	**0.944**	**0.060**	**0.059-0.062**	**0.036**
One-factorial	0.489	0.488	0.409	0-163-0.166	0.136

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual; bold: model with the best fit

Table 4: Results of the confirmatory factor analysis for the SACS-8

	rCFI	rTLI	rRMSEA	rRMSEA 95%CI	SRMR
Four-factorial	**0.965**	**0.931**	**0.078**	**0.075-0.082**	**0.048**
One-factorial	0.547	0.366	0.196	0.194-0.199	0.148

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual; bold: model with the best fit

Table 5: Measurement invariance for the bifactorial model of the PSS-10

5a) by gender

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.957	.943	.076	.074–.077	.038
Difference Δ	.000	.005	-.004	-.004–-.004	.001
Metric	.957	.949	.072	.070–.073	.039
Difference Δ	-.006	-.002	.001	.001-.001	.003
Scalar	.951	.948	.072	.071–.074	.042

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

5b) by age

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.954	.939	.077	.075–.079	.039
Difference Δ	-.002	.007	-.005	-.005–-.005	.005
Metric	.952	.946	.073	.071–.074	.044
Difference Δ	-.017	-.009	.006	.006-.006	.007
Scalar	.935	.937	.078	.077-.080	.050

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

5c) by education

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.958	.945	.075	.073-.077	.037
Difference Δ	-.001	.007	-.005	-.005--.005	.003
Metric	.958	.952	.070	.069-.072	.040
Difference Δ	-.008	-.002	.001	.001-.001	.004
Scalar	.950	.950	.072	.070-.073	.044

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

Table 6: Measurement invariance for the two-factorial model of the PSS-2&2

6a) by gender

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR

Configural	.992	.955	.075	.065–.086	.010
Difference Δ	.000	.002	-.019	-.019–-.025	.001
Metric	.992	.977	.053	.046–.061	.011
Difference Δ	-.006	-.005	.005	.004–.007	.007
Scalar	.986	.972	.059	.053–.065	.018

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

6b) by age

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.958	.945	.075	.073-.077	.037
Difference Δ	-.001	.007	-.005	-.005--.005	.003
Metric	.958	.952	.070	.069-.072	.040
Difference Δ	-.008	-.002	.001	.001-.001	.004
Scalar	.950	.950	.072	.070-.073	.044

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

6c) by education

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.993	.959	.072	.062-.082	.010
Difference Δ	-.002	.018	-.015	-.015--.022	.003
Metric	.991	.977	.053	.047-.060	.013
Difference Δ	-.009	-.008	.009	.010-.007	.006
Scalar	.982	.970	.062	.056-.067	.019

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

Table A.7: Measurement invariance for the eight-factorial model of the SACS-16

7a) by gender

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.973	.958	.044	.042-.045	.028
Difference Δ	.000	.001	-.001	-.001--.001	.001
Metric	.973	.960	.043	.042-.044	.029
Difference Δ	-.005	-.005	.003	.003-.003	.001
Scalar	.968	.954	.045	.044-.047	.030

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

7b) by age

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.974	.959	.043	.041-.044	.028
Difference Δ	-.001	.002	-.001	-.001--.001	.001
Metric	.973	.961	.042	.040-.043	.029
Difference Δ	-.012	-.013	.006	.006-.006	.005
Scalar	.962	.948	.048	.04-.049	.033

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

7c) by education

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.974	.958	.043	.042-.045	.028
Difference Δ	-.001	.002	-.001	-.001--.001	.001

Metric	.973	.960	.042	.041-.044	.029
Difference Δ	-.008	-.009	.005	.005-.005	.004
Scalar	.965	.951	.047	.046-.048	.033

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

Table A.8: Measurement invariance for the four-factorial model of the SACS-8

8a) by gender

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.972	.945	.058	.055-.060	.034
Difference Δ	.000	.006	-.003	-.003--.003	.001
Metric	.972	.950	.055	.052-.057	.035
Difference Δ	-.009	-.008	.004	.004-.004	.003
Scalar	.963	.942	.059	.056-.061	.038

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

8b) by age

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.974	.958	.043	.042-.045	.028
Difference Δ	-.001	.002	-.001	-.001--.001	.001
Metric	.973	.960	.042	.041-.044	.029
Difference Δ	-.008	-.009	.005	.005-.005	.004
Scalar	.965	.951	.047	.046-.048	.033

Source: RKI-Panel 2024
rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

8c) by education

	rCFI	rTLI	rRMSEA	rRMSEA 90% CI	SRMR
Configural	.970	.941	.060	.057-.063	.036
Difference Δ	.000	.009	-.005	-.005--.005	.001
Metric	.970	.950	.055	.052-.058	.037
Difference Δ	-.016	-.016	.008	.008-.008	.006
Scalar	.955	.934	.063	.061-.065	.043

Source: RKI-Panel 2024

rCFI = relative Comparative Fit Index; rTLI = relative Tucker-Lewis Index; rRMSEA = relative Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual

Table 9: Omega values for internal consistency for the PSS-10 and PSS-2&2

	perceived helplessness	*perceived self-efficacy*
PSS-10	0.877	0.793
PSS-2&2	0.799	0.721

Source: RKI-Panel 2024

Table 10: Omega values for internal consistency for the SACS-16 und SACS-8

	emotional support	*instrumental support*	*perseverance*	*coping flexibility*	*problem solving*	*repression*	*wishful thinking*	*proactive coping*	*active coping*
SACS-16	0.794	0.832	0.684	0.740	0.747	0.276	0.763	0.636	--
SACS-8	--	0.832	--	--	--	0.276	0.763	--	0.640

Source: RKI-Panel 2024

-- not applicable

Table 11: Weighted stratified mean values for perceived stress and proportion of persons with elevated stress levels based on the PSS-10 – by gender

11a) Women (*n* = 14,762)

Characteristic		total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
		M	95% CI	*M*	95% CI	*M*	95% CI	*%*	95% CI
Gender	wo-men	15.9	[15.7 - 16.1]	9.6	[9.5 - 9.8]	6.2	[6.2 - 6.3]	57.7	[55.6 - 59.7]
Age (in years)	18-29	19.1	[18.8 - 19.5]	12	[11.7 - 12.2]	7.2	[7.0 - 7.3]	2.6	[2.3 – 3.0]
	30-44	17	[16.6 - 17.3]	10.5	[10.2 - 10.8]	6.5	[6.3 - 6.6]	3.2	[2.9 – 3.5]
	45-64	15.2	[14.9 - 15.5]	9.3	[9.1 - 9.5]	6	[5.8 - 6.1]	3.5	[3.2 – 3.8]
	65-79	13.2	[12.9 - 13.5]	7.8	[7.6 - 8.0]	5.4	[5.3 - 5.6]	1.2	[1.0 – 1.3]
	80-99	15.9	[15.4 - 16.5]	9.1	[9.2 - 9.7]	6.8	[6.5 - 7.0]	1.0	[0.8 – 1.2]
Educa-tion	low	16.3	[15.9 - 16.6]	9.5	[9.2 - 9.7]	6.8	[6.6 - 6.9]	3.8	[3.3 – 4.2]
	me-dium	15.9	[15.7 - 16.1]	9.8	[9.7 - 10.0]	6.1	[6.0 - 6.2]	5.9	[5.5 - 6.3]
	high	15.2	[14.9 - 15.4]	9.6	[8.7 - 9.5]	5.6	[5.5 - 5.7]	1.8	[1.6 – 2.0]

Source: RKI-Panel 2024

M = mean; CI = confidence interval; range for the total score: 0–40; range for *perceived helplessness*: 0–24; range for *perceived self-efficacy*: 0–16

11b) Men (*n* = 12,340)

Characteristic		total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
		M	95% CI	*M*	95% CI	*M*	95% CI	*%*	95% CI
Gender	men	14.4	[14.2 - 14.6]	8.5	[8.4 - 8.6]	5.9	[5.8 - 6.0]	42.3	[40.3 - 44.4]
Age (in years)	18-29	16.2	[15.8 - 16.6]	9.5	[9.2 - 9.8]	6.7	[6.5 - 6.9]	1.8	[1.5 – 2.1]
	30-44	15.5	[15.1 - 15.9]	9.3	[9.0 - 9.5]	6.3	[6.1 - 6.4]	2.5	[2.2 – 2.9]
	45-64	14.0	[13.7 - 14.4]	8.4	[8.2 - 8.6]	5.6	[5.5 - 5.8]	3.0	[2.6 – 3.3]
	65-79	12.0	[11.7 - 12.3]	6.9	[6.7 - 7.1]	5.2	[5.0 - 5.3]	0.8	[0.7 – 0.9]
	80-99	13.8	[13.2 - 14.3]	7.8	[7.4 - 8.2]	6	[5.7 - 6.2]	0.4	[0.3 – 0.5]

Education	low	15.2	[14.9 - 15.6]	8.7	[8.4 - 8.9]	6.6	[6.4 - 6.7]	3.3	[2.8 – 3.8]
	medium	14.4	[14.2 - 14.7]	8.6	[8.4 - 8.8]	5.8	[5.7 - 5.9]	3.8	[3.4 – 4.1]
	high	13.1	[12.8 - 13.3]	8	[7.8 - 8.2]	5.1	[5.0 - 5.2]	1.4	[1.2 – 1.6]

Source: RKI-Panel 2024

M = mean; CI = confidence interval; range for the total score: 0–40; range for *perceived helplessness*: 0–24; range for *perceived self-efficacy*: 0–16

Table 12: Results of the regression models for *perceived stress* (PSS-10) on gender, age, and education

Predictor	total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
	β	SE(B)	β	SE(B)	β	SE(B)	AOR	95% CI
Gender: male	ref.							
Gender: female	**0.115 *****	0.111	**0.131 *****	0.082	**0.057 *****	0.048	**1.468 *****	[1.338-1.610]
Age: 18-29 years	ref.							
Age: 30-44 years	**-0.080 *****	0.197	**-0.070 *****	0.143	**-0.072 *****	0.084	**0.836***	[0.722-0.968]
Age: 45-64 years	**-0.212 *****	0.180	**-0.185 *****	0.131	**-0.193 *****	0.074	**0.592 *****	[0.520-0.673]
Age: 65-79 years	**-0.303 *****	0.181	**-0.282 *****	0.130	**-0.249 *****	0.082	**0.274 *****	[0.231-0.324]
Age: 80-99 years	**-0.135 *****	0.256	**-0.136 *****	0.190	**-0.096 *****	0.106	**0.435 *****	[0.467-0.613]
Education: low	ref.							
Education: medium	**-0.106 *****	0.159	**-0.053 *****	0.118	**-0.161 *****	0.068	**0.736 *****	[0.650 – 0.833]
Education: high	**-0.140 *****	0.178	**-0.073 *****	0.126	**-0.207 *****	0.077	**0.535 *****	[0.467-0.613]

Source: RKI-Panel 2024

β = standardized regression coefficient; SE = standard error; ref = reference category; bold = statistically significant results; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 13: Weighted stratified mean values for *coping* based on the SACS-16 – by gender

13a) Women (*n* = 14,762)

Characteristic		*emotional support*		*instrumental support*		*perseverance*		*coping flexibility*		*problem solving*		*repression*		*wishful thinking*		*proactive coping*	
		M	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI
Gender	women	3	[3.0 - 3.1]	2.8	[2.7 - 2.8]	3.1	[3.1 - 3.2]	3	[3.0 - 3.0]	3.2	[3.1 - 3.2]	2	[1.9 - 2.0]	2.2	[2.2 - 2.2]	2.1	[2.1 - 2.1]
Age (in years)	18-29	3.2	[3.1 - 3.2]	2.9	[2.9 - 3.0]	3.1	[3.0 - 3.1]	2.7	[2.7 - 2.8]	3	[2.9 - 3.0]	2.2	[2.1 - 2.2]	2.7	[2.7 - 2.8]	2.3	[2.2 - 2.3]
	30-44	3.2	[3.1 - 3.2]	2.9	[2.8 - 2.9]	3.2	[3.1 - 3.2]	2.9	[2.9 - 3.0]	3.2	[3.1 - 3.2]	2	[2.0 - 2.1]	2.3	[2.3 - 2.4]	2.2	[2.2 - 2.3]
	45-64	3.1	[3.1 - 3.2]	2.8	[2.8 - 2.9]	3.2	[3.2 - 3.3]	3.1	[3.0 - 3.1]	3.3	[3.2 - 3.3]	1.9	[1.9 - 2.0]	2.1	[2.1 - 2.1]	2.1	[2.0 - 2.1]
	65-79	2.8	[2.8 - 2.9]	2.6	[2.6 - 2.7]	3.2	[3.1 - 3.2]	3.1	[3.1 - 3.2]	3.3	[3.2 - 3.3]	1.8	[1.8 - 1.9]	1.9	[1.9 - 1.9]	2	[2.0 - 2.1]
	80-99	2.5	[2.4 - 2.6]	2.3	[2.3 - 2.4]	2.8	[2.7 - 2.9]	2.8	[2.7 - 2.8]	2.9	[2.8 - 3.0]	1.8	[1.8 - 1.9]	1.9	[1.8 - 2.0]	1.8	[1.8 - 1.9]
Education	low	2.8	[2.7 - 2.8]	2.6	[2.5 - 2.6]	3	[3.0 - 3.1]	2.9	[2.9 - 2.9]	3	[3.0 - 3.1]	2	[1.9 - 2.0]	2.1	[2.1 - 2.2]	2	[2.0 - 2.1]
	medium	3.1	[3.1 - 3.1]	2.8	[2.8 - 2.8]	3.2	[3.2 - 3.2]	3	[3.0 - 3.0]	3.2	[3.2 - 3.2]	2	[2.0 - 2.0]	2.2	[2.2 - 2.2]	2.1	[2.1 - 2.1]
	high	3.3	[3.3 - 3.3]	2.9	[2.9 - 3.0]	3.3	[3.2 - 3.3]	3.1	[3.0 - 3.1]	3.3	[3.3 - 3.4]	1.9	[1.9 - 1.9]	2.1	[2.1 - 2.2]	2.2	[2.2 - 2.3]

Source: RKI-Panel 2024

M = mean; CI = confidence interval; range for each coping scale: 0–6

13b) Men (n = 12,340)

Characteristic		*emotional support*		*instrumental support*		*perseverance*		*coping flexibility*		*problem solving*		*repression*		*wishful thinking*		*proactive coping*	
		M	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI	*M*	95% CI
Gender	men	2.6	[2.6 - 2.6]	2.5	[2.5 - 2.5]	3.1	[3.0 - 3.1]	3	[3.0 - 3.0]	3.2	[3.2 - 3.2]	1.9	[1.9 - 1.9]	2.1	[2.1 - 2.1]	2.2	[2.2 - 2.2]
Age (in years)	18-29	2.7	[2.7 - 2.8]	2.6	[2.6 - 2.7]	3.1	[3.0 - 3.1]	2.8	[2.8 - 2.9]	3.1	[3.0 - 3.1]	2	[1.9 - 2.0]	2.5	[2.4 - 2.6]	2.4	[2.3 - 2.4]
	30-44	2.7	[2.7 - 2.8]	2.6	[2.5 - 2.6]	3.1	[3.0 - 3.1]	2.9	[2.9 - 3.0]	3.2	[3.2 - 3.3]	2	[1.9 - 2.0]	2.3	[2.3 - 2.4]	2.3	[2.2 - 2.3]
	45-64	2.7	[2.6 - 2.7]	2.5	[2.5 - 2.6]	3.1	[3.1 - 3.1]	3	[3.0 - 3.1]	3.3	[3.3 - 3.3]	1.9	[1.8 - 1.9]	2	[2.0 - 2.1]	2.2	[2.1 - 2.2]
	65-79	2.4	[2.3 - 2.4]	2.4	[2.3 - 2.4]	3	[3.0 - 3.0]	3.1	[3.1 - 3.2]	3.3	[3.3 - 3.3]	1.8	[1.7 - 1.8]	1.8	[1.8 - 1.9]	2.1	[2.1 - 2.2]
	80-99	2.1	[2.0 - 2.2]	2.2	[2.1 - 2.3]	2.8	[2.7 - 2.8]	2.9	[2.8 - 2.9]	3	[3.0 - 3.1]	1.8	[1.7 - 1.8]	1.8	[1.7 - 1.8]	2	[2.0 - 2.1]
Education	low	2.4	[2.4 - 2.5]	2.4	[2.4 - 2.5]	2.9	[2.9 - 3.0]	2.9	[2.9 - 2.9]	3.1	[3.0 - 3.1]	2	[1.9 - 2.0]	2.2	[2.1 - 2.2]	2.1	[2.1 - 2.2]
	medium	2.6	[2.6 - 2.7]	2.5	[2.5 - 2.6]	3.1	[3.1 - 3.1]	3	[3.0 - 3.0]	3.2	[3.2 - 3.3]	1.9	[1.9 - 1.9]	2.2	[2.1 - 2.2]	2.2	[2.2 - 2.3]
	high	2.8	[2.8 - 2.8]	2.6	[2.5 - 2.6]	3.2	[3.1 - 3.2]	3.1	[3.1 - 3.1]	3.4	[3.4 - 3.4]	1.8	[1.8 - 1.8]	2	[1.9 - 2.0]	2.3	[2.3 - 2.3]

Source: RKI-Panel 2024

M = mean; CI = confidence interval; range for each coping scale: 0–6

Table 14: Results of the regression models for *coping* (SACS-16) on gender, age, and education

Characteristic	*emotional support*		*instrumental support*		*perseverance*		*coping flexibility problem solving repression*						*wishful thinking proactive coping*			
	β	SE(B)	β	SE(B)	β	SE(B)	β	SE(B)	β	SE(B)	β	SE(B)	β	SE(B)	β	SE(B)
Gender: male	ref.															
Gender: female	**0.244** ***	0.015	**0.145** ***	0.016	**0.057** ***	0.012	-0.014	0.013	**-0.035** **	0.013	**0.049** ***	0.012	**0.046** ***	0.015	**-0.059** **	0.014
Age: 18-29 years	ref.															
Age: 30-33 years	-0.007	0.027	-0.021	0.026	**0.027** *	0.023	**0.094** ***	0.021	**0.094** **	0.023	**-0.033***	0.023	**-0.131** ***	0.031	**-0.040** **	0.026
Age: 45-64 years	-0.024	0.025	**-0.038** **	0.025	**0.080** ***	0.020	**0.183** ***	0.020	**0.171** **	0.020	**-0.118** ***	0.021	**-0.290** ***	0.027	**-0.106** **	0.023
Age: 65-79 years	**-0.119** ***	0.026	**-0.101** ***	0.026	**0.024***	0.022	**0.207** ***	0.022	**0.167** **	0.022	**-0.165** ***	0.023	**-0.330** ***	0.028	**-0.109** **	0.026
Age: 80-99 years	**-0.162** ***	0.036	**-0.129** ***	0.036	**-0.073** ***	0.034	**0.035** **	0.033	0.002	0.033	**-0.118** ***	0.030	**-0.232** ***	0.038	**-0.117** **	0.034
Education: low	ref.															

Education: medium	**0.092** ***	0.020	**0.047** ***	0.021	**0.082** ***	0.018	**0.075** ***	0.016	**0.118** **	0.017	**-0.061** ***	0.017	**-0.068** ***	0.023	0.006	0.018
Education: high	**0.153** ***	0.021	**0.071** ***	0.023	**0.114** ***	0.019	**0.107** ***	0.018	**0.176** **	0.019	**-0.110** ***	0.019	**-0.099** ***	0.025	**0.064****	0.019

Source: RKI-Panel 2024

β = standardized regression coefficient; SE = standard error; ref = reference category; bold = statistically significant results; *$p < 0,05$, **$p < 0,01$, ***$p < 0,001$

Table 15: Results of the adjusted regression models for *perceived stress* (PSS-10) on *coping* (SACS-16), including interactions

Predictor	total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
	β	SE(B)	β	SE(B)	β	SE(B)	AOR	95% CI
Emotional support	0.078	0.315	**0.094***	0.226	0.032	0.176	1.499	[0.987 - 2.277]
Instrumental support	-0.046	0.312	-0.058	0.236	-0.016	0.165	0.798	[0.549 - 1.160]
Perseverance	-0.001	0.343	0.035	0.266	-0.058	0.176	1.220	[0.765 - 1.945]
Coping flexibility	**-0.135 *** **	0.374	**-0.134 ** **	0.286	**-0.104***	0.188	0.670	[0.435 - 1.033]
Problem solving	**-0.137 *** **	0.375	**-0.104***	0.293	**-0.154 ** **	0.207	**0.436 *** **	[0.276 - 0.689]
Repression	**0.213 *** **	0.284	**0.199 *** **	0.230	**0.174 *** **	0.159	**1.680 *** **	[1.226 - 2.301]
Wishful thinking	**0.282 *** **	0.270	**0.297 *** **	0.203	**0.178 *** **	0.134	**2.514 *** **	[1.735 - 3.643]
Proactive coping	**-0.077***	0.298	-0.037	0.221	**-0.114 ** **	0.152	**0.606***	[0.408 - 0.900]
Gender: male	ref.							
Gender: female	**0.185 *** **	0.672	**0.146 ** **	0.548	**0.207 *** **	0.317	1.750	[0.897 - 3.413]
Age: 18-29 years	ref.							
Age: 30-44 years	0.110	1.126	0.110	1.007	0.070	0.569	2.623	[0.828 - 8.311]
Age: 45-64 years	-0.003	1.056	0.057	0.806	-0.114	0.484	0.766	[0.269 - 2.177]
Age: 65-79 years	**-0.195 *** **	1.018	**-0.133***	0.783	**-0.253 *** **	0.509	0.545	[0.163 - 1.824]

Age: 80-99 years	**-0.170 *****	1.289	**-0.148 ****	1.023	**-0.180 *****	0.619	**0.240***	[0.065 - 0.885]
Education: low	ref.							
Education: medium	0.185	0.765	0.110	0.657	-0.051	0.418	2.115	[0.979 - 4.567]
Education: high	0.062	0.889	0.070	0.722	-0.071	0.481	1.716	[0.691 - 4.261]
Emotional support x age 30-44	0.047	0.231	0.022	0.171	0.068	0.121	0.858	[0.681 - 1.080]
Emotional support x age 45-64	0.041	0.216	-0.001	0.156	0.090	0.114	0.950	[0.757 - 1.193]
Emotional support x age 65-79	-0.018	0.222	-0.031	0.160	0.010	0.124	0.925	[0.696 - 1.231]
Emotional support x age 80-99	0.036	0.309	0.002	0.221	**0.075***	0.160	1.177	[0.806 - 1.719]
Emotional support x female	-0.069	0.131	-0.015	0.092	**-0.144 ****	0.066	**0.808***	[0.678 - 0.962]
Emotional support x medium education	-0.058	0.177	-0.064	0.137	-0.019	0.083	1.040	[0.846 - 1.278]
Emotional support x high education	-0.048	0.201	-0.042	0.150	-0.035	0.091	1.079	[0.861 - 1.352]
Instrumental support x age 30-44	-0.034	0.230	-0.031	0.166	-0.024	0.121	1.077	[0.838 - 1.385]
Instrumental support x age 45-64	0.023	0.212	0.002	0.158	0.062	0.107	1.118	[0.886 - 1.412]
Instrumental support x age 65-79	**0.072***	0.211	0.055	0.158	**0.082***	0.115	1.241	[0.934 - 1.648]
Instrumental support x age 80-99	**0.066***	0.316	**0.073***	0.222	0.042	0.156	1.300	[0.862 - 1.959]
Instrumental support x female	-0.033	0.143	-0.039	0.106	-0.014	0.064	1.043	[0.887 - 1.227]

Instrumental support x medium education	**0.079***	0.171	**0.103***	0.134	0.011	0.085	1.017	[0.821 - 1.260]
Instrumental support x high education	0.014	0.198	0.038	0.151	-0.031	0.092	0.862	[0.690 - 1.077]
Perseverance x age 30-44	**0.107***	0.272	0.117	0.213	0.055	0.123	**1.407***	[1.061 - 1.866]
Perseverance x age 45-64	0.106	0.246	0.115	0.190	0.055	0.120	1.279	[0.964 - 1.697]
Perseverance x age 65-79	0.037	0.253	0.024	0.195	0.042	0.124	1.104	[0.793 - 1.537]
Perseverance x age 80-99	0.051	0.358	0.079	0.262	-0.002	0.171	1.053	[0.681 - 1.629]
Perseverance x female	-0.020	0.155	-0.016	0.121	-0.019	0.068	0.897	[0.752 - 1.070]
Perseverance x medium education	**-0.131 ****	0.217	**-0.124 ***	0.169	-0.097	0.097	**0.710***	[0.546 - 0.923]
Perseverance x high education	-0.067	0.234	-0.087	0.178	-0.017	0.104	0.843	[0.641 - 1.107]
Coping flexibility x age 30-44	**-0.226 *****	0.265	**-0.193 *****	0.206	**-0.206 *****	0.125	**0.630 *****	[0.480 - 0.826]
Coping flexibility x age 45-64	**-0.123***	0.279	-0.073	0.214	**-0.157***	0.127	**0.724***	[0.558 - 0.940]
Coping flexibility x age 65-79	-0.030	0.291	-0.006	0.223	-0.051	0.135	0.814	[0.596 - 1.112]
Coping flexibility x age 80-99	0.025	0.399	0.033	0.287	0.017	0.192	0.760	[0.511 - 1.132]
Coping flexibility x female	-0.064	0.174	-0.040	0.132	-0.081	0.082	0.967	[0.814 - 1.148]
Coping flexibility x medium education	**-0.105***	0.220	**-0.136***	0.177	-0.027	0.114	0.865	[0.669 - 1.118]
Coping flexibility x high education	0.005	0.241	-0.003	0.187	0.016	0.127	0.886	[0.679 - 1.156]
Problem solving x age 30-44	-0.034	0.309	0.014	0.249	-0.094	0.140	0.847	[0.634 - 1.133]

Problem solving x age 45-64	**-0.164 ****	0.269	**-0.135 ***	0.205	**-0.158***	0.129	0.875	[0.666 - 1.149]
Problem solving x age 65-79	-0.034	0.284	-0.010	0.216	-0.055	0.149	0.939	[0.680 - 1.298]
Problem solving x age 80-99	-0.059	0.432	-0.045	0.312	-0.067	0.215	1.107	[0.687 - 1.786]
Problem solving x female	0.066	0.187	0.037	0.145	0.088	0.087	**1.329 ****	[1.108 - 1.594]
Problem solving x medium education	0.077	0.230	0.086	0.177	0.046	0.134	1.118	[0.865 - 1.444]
Problem solving x high education	0.006	0.264	0.013	0.196	0.001	0.146	1.232	[0.942 - 1.610]
Repression x age 30-44	0.028	0.244	0.022	0.185	0.038	0.115	1.042	[0.819 - 1.327]
Repression x age 45-64	**0.067***	0.213	0.039	0.165	**0.102 ****	0.106	1.179	[0.944 - 1.471]
Repression x age 65-79	0.043	0.214	0.011	0.159	**0.090 ****	0.112	1.074	[0.837 - 1.379]
Repression x age 80-99	-0.006	0.292	-0.021	0.222	0.027	0.149	0.904	[0.645 - 1.265]
Repression x female	-0.060	0.143	-0.044	0.115	**-0.082 ****	0.062	0.954	[0.825 - 1.104]
Repression x medium education	-0.004	0.177	0.009	0.141	-0.015	0.094	0.958	[0.799 - 1.148]
Repression x high education	-0.011	0.179	0.002	0.144	-0.024	0.098	0.965	[0.794 - 1.172]
Wishful thinking x age 30-44	**-0.076 ****	0.187	**-0.100***	0.141	-0.019	0.090	0.887	[0.703 - 1.119]
Wishful thinking x age 45-64	-0.032	0.176	-0.056	0.129	0.016	0.080	1.050	[0.849 - 1.299]
Wishful thinking x age 65-79	-0.029	0.190	-0.039	0.140	-0.010	0.086	0.969	[0.743 - 1.264]
Wishful thinking x age 80-99	0.006	0.318	-0.004	0.225	0.018	0.149	1.401	[0.981 - 2.001]

Wishful thinking x female	0.038	0.120	**0.074***	0.095	-0.024	0.053	0.947	[0.823 - 1.089]
Wishful thinking x medium education	0.018	0.164	-0.027	0.121	**0.080***	0.087	0.926	[0.767 - 1.118]
Wishful thinking x high education	0.018	0.171	-0.016	0.131	**0.065***	0.092	0.835	[0.686 - 1.017]
Proactive coping x age 30-44	**0.065***	0.216	0.036	0.164	**0.089***	0.109	1.209	[0.940 - 1.554]
Proactive coping x age 45-64	0.035	0.208	0.024	0.154	0.036	0.107	1.138	[0.889 - 1.457]
Proactive coping x age 65-79	0.040	0.207	0.040	0.149	0.022	0.112	1.076	[0.802 - 1.443]
Proactive coping x age 80-99	0.017	0.306	0.010	0.223	0.024	0.148	0.907	[0.606 - 1.358]
Proactive coping x female	-0.021	0.134	-0.036	0.098	0.008	0.065	1.035	[0.876 - 1.224]
Proactive coping x medium education	0.015	0.188	0.031	0.144	-0.019	0.084	1.208	[0.984 - 1.482]
Proactive coping x high education	0.014	0.183	0.023	0.141	-0.008	0.083	1.116	[0.898 - 1.388]

Source: RKI-Panel 2024

β = standardized regression coefficient; SE = standard error; AOR = adjusted odds ratio; CI = confidence interval; ref. = reference category; bold = statistically significant results; $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Table 16: Follow-up of significant interactions using slope analysis

16a) Slope of *coping* (SACS-16) on *stress* (PSS-10) by gender

Predictor	total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
	b(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value
Emotional support x gender								
Female	--	--	--	--	-0.17 (0.05)	< 0.01	-0.00 (0.06)	0.99
Male	--	--	--	--	-0.01 (0.05)	0.81	0.21 (0.06)	<0.01
Problem solving x gender								
Female	--	--	--	--	--	--	-0.20 (0.07)	<0.01
Male	--	--	--	--	--	--	-0.48 (0.08)	<0.01
Repression x gender								
Female	--	--	--	--	0.53 (0.05)	<0.01	--	--
Male	--	--	--	--	0.71 (0.05)	<0.01	--	--
Wishful thinking x gender								
Female	--	--	1.72 (0.07)	<0.01	--	--	--	--
Male	--	--	1.52 (0.07)	<0.01	--	--	--	--

Source: RKI-Panel 2024

b = conditional unstandardized regression coefficient; SE = standard error; -- not applicable

16b) Slope of *coping* (SACS-16) on *stress* (PSS-10) by age group

Predictor	total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
	b(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value

Emotional support x age group								
18-29 years	--	--	--	--	-0.14 (0.11)	0.23	--	--
30-44 years	--	--	--	--	0.02 (0.07)	0.83	--	--
45-64 years	--	--	--	--	0.05 (0.06)	0.40	--	--
65-79 years	--	--	--	--	-0.09 (0.07)	0.17	--	--
80-99 years	--	--	--	--	0.22 (0.12)	0.07	--	--
Instrumental support × age group								
18-29 years	-0.29 (0.19)	0.14	-0.20 (0.14)	0.14	-0.09 (0.11)	0.42	--	--
30-44 years	-0.51 (0.16)	<0.01	-0.36 (0.12)	<0.01	-0.15 (0.08)	0.05	--	--
45-64 years	-0.18 (0.15)	0.23	-0.23 (0.11)	0.04	0.05 (0.07)	0.46	--	--
65-79 years	0.16 (0.14)	0.28	0.03 (0.10)	0.78	0.13 (0.07)	0.07	--	--
80-99 years	0.41 (0.25)	0.10	0.29 (0.18)	0.10	0.12 (0.12)	0.30	--	--
Perseverance × age group								
18-29 years	-0.40 (0.22)	0.07	--	--	--	--	-0.09 (0.14)	0.53
30-44 years	0.18 (0.21)	0.38	--	--	--	--	0.26 (0.10)	0.01
45-64 years	0.09 (0.18)	0.61	--	--	--	--	0.17 (0.10)	0.08
65-79 years	-0.15 (0.16)	0.35	--	--	--	--	0.02 (0.12)	0.88
80-99 years	0.09 (0.28)	0.75	--	--	--	--	-0.05 (0.18)	0.78
Coping flexibility × age group								

18-29 years	-1.65 (0.23)	<0.01	-1.11 (0.17)	<0.01	-1.11 (0.17)	<0.01	-0.52 (0.13)	<0.01
30-44 years	-2.89 (0.22)	<0.01	-1.85 (0.17)	<0.01	-1.85 (0.17)	<0.01	-0.99 (0.11)	<0.01
45-64 years	-2.23 (0.19)	<0.01	-1.36 (0.14)	<0.01	-1.36 (0.14)	<0.01	-0.84 (0.10)	<0.01
65-79 years	-1.83 (0.21)	<0.01	-1.16 (0.15)	<0.01	-1.16 (0.15)	<0.01	-0.73 (0.13)	<0.01
80-99 years	-1.41 (0.35)	<0.01	-0.96 (0.24)	<0.01	-0.96 (0.24)	<0.01	-0.76 (0.18)	<0.01
Problem solving × age group								
18-29 years	-0.98 (0.24)	<0.01	0.50 (0.18)	0.01	-0.48 (0.12)	<0.01	--	--
30-44 years	-1.14 (0.23)	<0.01	-0.46 (0.19)	0.01	-0.68 (0.12)	<0.01	--	--
45-64 years	-1.70 (0.21)	<0.01	-0.93 (0.16)	<0.01	-0.78 (0.10)	<0.01	--	--
65-79 years	-1.20 (0.22)	<0.01	-0.59 (0.16)	<0.01	-0.61 (0.11)	<0.01	--	--
80-99 years	-1.47 (0.39)	<0.01	-0.75 (0.28)	0.01	-0.72 (0.17)	<0.01	--	--
Repression × age group								
18-29 years	1.74 (0.18)	<0.01	--	--	0.52 (0.09)	<0.01	--	--
30-44 years	1.97 (0.18)	<0.01	--	--	0.64 (0.09)	<0.01	--	--
45-64 years	2.22 (0.15)	<0.01	--	--	0.83 (0.08)	<0.01	--	--
65-79 years	2.14 (0.16)	<0.01	--	--	0.87 (0.08)	<0.01	--	--
80-99 years	1.66 (0.28)	<0.01	--	--	0.68 (0.13)	<0.01	--	--
Wishful thinking × age group								

18-29 years	2.38 (0.17)	<0.01	1.70 (0.12)	<0.01	--	--	--	--
30-44 years	1.89 (0.14)	<0.01	1.26 (0.11)	<0.01	--	--	--	--
45-64 years	2.18 (0.13)	<0.01	1.45 (0.10)	<0.01	--	--	--	--
65-79 years	2.13 (0.15)	<0.01	1.48 (0.11)	<0.01	--	--	--	--
80-99 years	2.51 (0.26)	<0.01	1.70 (0.19)	<0.01	--	--	--	--
Proactive coping × age group								
18-29 years	-0.72 (0.19)	<0.01	--	--	-0.44 (0.10)	<0.01	--	--
30-44 years	-0.27 (0.17)	0.11	--	--	-0.19 (0.08)	0.02	--	--
45-64 years	-0.49 (0.13)	<0.01	--	--	-0.35 (0.06)	<0.01	--	--
65-79 years	-0.40 (0.14)	<0.01	--	--	-0.37 (0.07)	<0.01	--	--
80-99 years	-0.62 (0.26)	0.02	--	--	-0.36 (0.12)	<0.01	--	--

Source: RKI-Panel 2024

b = conditional unstandardized regression coefficient; SE = standard error; -- not applicable

16c) Slope of *coping* (SACS-16) on *stress* (PSS-10) by education

Predictor	total score		*perceived helplessness*		*perceived self-efficacy*		% with elevated perceived stress (≥75th percentile)	
	b(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value	*b*(SE)	*p*-value
Instrumental support × education								
Low	-0.24 (0.16)	0.14	-0.26 (0.12)	0.03	--	--	--	--
Medium	0.14 (0.12)	0.24	0.08 (0.09)	0.35	--	--	--	--

High	-0.15 (0.14)	0.29	-0.10 (0.10)	0.30	--	--	--	--
Perseverance × education								
Low	0.28 (0.19)	0.14	0.28 (0.19)	0.14	--	--	0.23 (0.12)	0.05
Medium	-0.30 (0.14)	0.03	-0.30 (0.14)	0.03	--	--	-0.11 (0.08)	0.18
High	-0.09 (0.16)	0.57	-0.09 (0.16)	0.57	--	--	0.06 (0.10)	0.51
Coping flexibility × education								
Low	-1.85 (0.21)	<0.01	-1.14 (0.16)	<0.01	--	--	--	--
Medium	-2.33 (0.17)	<0.01	-1.57 (0.12)	<0.01	--	--	--	--
High	-1.82 (0.19)	<0.01	-1.15 (0.14)	<0.01	--	--	--	--
Wishful thinking × education								
Low	--	--	--	--	0.56 (0.08)	<0.01	--	--
Medium	--	--	--	--	0.76 (0.05)	<0.01	--	--
High	--	--	--	--	0.78 (0.05)	<0.01	--	--

Source: RKI-Panel 2024

b = conditional unstandardized regression coefficient; SE = standard error; -- not applicable

Additional information on 4. Discussion – instrument testing

The results of the instrument testing indicate a largely stable measurement structure that is comparable across groups for the long and short versions of the PSS and SACS. Limitations are that comparisons can be made only partially between age groups for the PSS-10 and SACS-16, and between education groups for the SACS-8. Reliability (internal consistency) was acceptable to very good for all four instruments, except for the factor *repression*, which had an omega of 0.28 in both the SACS-16 and SACS-8 and should therefore be further monitored and examined for optimization potential.

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