Supplemental Materials for

A Three-Dimensional Taxonomy of Achievement Emotions

This file includes:

1. Supplemental Materials for Several Studies

2. Study 2 Supplemental Analyses

3. Study 3 Supplemental Analyses

4. Study 4 Supplemental Analyses

5. Achievement Emotions Questionnaire – Revised (AEQ–R)

6. Sample Mplus and MLwiN Syntax

Table S1

Descriptive Statistics and Correlations of Achievement Emotion Scores in Studies 1−3

	1	2	3	4	5	6	7	8	9	10	11	12
						Study 1						
1 Enjoyment	−											
2 Hope	.401	−										
3 Pride	.352	.561	−									
4 Relaxation	.490	.288	.221	−								
5 Assurance	−	−	−	−	−							
6 Relief	.083	.127	.366	–.203	−	−						
7 Anger	.079	–.287	–.258	–.378	−	.157	−					
8 Anxiety	–.228	–.454	–.280	–.571	−	.408	.625	−				
9 Shame	–.226	–.404	–.390	–.343	−	.244	.499	.700	−			
10 Boredom	–.541	–.287	–.263	–.271	−	.143	.595	.420	.344	−		
11 Hopelessness	–.268	–.608	–.475	–.394	−	.107	.698	.708	.718	.426	−	
12 Disappointment	–.124	–.263	–.263	–.278	−	.260	.309	.502	.734	.203	.477	−
M	2.97	3.69	4.00	2.77	−	4.01	2.34	3.03	2.61	2.78	2.09	3.08
SD	0.97	0.88	0.89	0.92	−	0.93	1.07	1.16	1.31	1.22	1.04	1.28
Skewness	–.07	–.45	–.63	.07	−	–.77	.42	–.31	.25	.27	.67	–.07
Kurtosis	–.30	.06	.68	–.14	−	–.51	–.55	–.70	–.18	–.81	–.32	–.10
Alpha	.87	.80	.88	.88	−	.79	.87	.92	.93	.93	.93	.91
						Study 2						
2 Hope	.501	−										
3 Pride	.485	.596	−									
4 Relaxation	.550	.509	.427	−								
5 Assurance	.414	.625	.564	.642	−							
6 Relief	.206	.251	.583	.115	.133	−						
7 Anger	–.492	–.339	–.168	–.446	–.160	–.013	−					
8 Anxiety	–.170	–.296	–.096	–.421	–.360	.413	.493	−				
9 Shame	–.189	–.363	–.113	–.327	–.294	.314	.467	.714	−			
10 Boredom	–.385	–.234	–.157	–.195	–.055	.004	.623	.321	.382	−		
11 Hopelessness	–.373	–.495	–.356	–.401	–.423	.071	.626	.605	.564	.418	−	
12 Disappointment	–.171	–.376	–.118	–.277	–.289	.252	.345	.596	.774	.304	.470	−
M	2.85	3.54	3.59	2.88	3.12	3.71	1.94	2.53	2.33	2.55	1.69	2.75
SD	1.00	1.02	1.06	1.00	1.12	1.06	1.02	1.03	1.30	1.20	0.97	1.25
Skewness	–.07	–.51	–.59	–.10	–.09	–.70	.97	.27	.61	.33	1.37	.22
Kurtosis	–.54	–.10	–.25	–.36	–.57	–.14	.32	–1.02	–.77	–.82	1.29	–1.07
Alpha	.88	.87	.93	.89	.88	.82	.89	.92	.92	.91	.94	.92

Table S1 *(continued)*

	1	2	3	4	5	6	7	8	9	10	11	12
						Study 3						
2 Hope	.322	–										
	.382	–										
	.387	–										
3 Pride	.430	.347	–									
	.499	.441	–									
	.498	.532	–									
4 Relaxation	.591	.509	.370	–								
	.547	.622	.446	–								
	.500	.577	.352	–								
5 Assurance	.206	.575	.42	.595	–							
	.245	.545	.424	.658	–							
	.363	.629	.498	.672	–							
6 Relief	.347	.05	.234	–.029	–.300	–						
	.344	.133	.441	–.062	–.174	–						
	.350	.169	.428	–.099	–.02	–						
7 Anger	–.744	–.143	–.16	–.429	–.027	–.143	–					
	–.823	–.351	–.348	–.55	–.218	–.174	–					
	–.784	–.387	–.391	–.544	–.344	–.18	–					
8 Anxiety	–.140	–.444	–.267	–.556	–.627	.43	.267	–				
	–.263	–.561	–.292	–.682	–.583	.304	.425	–				
	–.276	–.478	–.303	–.633	–.558	.307	.491	–				
9 Shame	–.116	–.432	–.293	–.377	–.473	.213	.179	.697	–			
	–.182	–.45	–.275	–.486	–.438	.141	.278	.736	–			
	–.182	–.458	–.312	–.405	–.427	.156	.316	.748	–			
10 Boredom	–.726	.008	–.161	–.265	.181	–.273	.791	–.009	.018	–		
	–.746	–.146	–.219	–.274	.02	–.219	.775	.146	.15	–		
	–.74	–.185	–.338	–.276	–.152	–.259	.758	.21	.141	–		
11 Hopelessness	–.253	–.496	–.286	–.471	–.424	.096	.389	.721	.668	.137	–	
	–.302	–.669	–.339	–.596	–.485	.03	.488	.796	.743	.235	–	
	–.348	–.656	–.375	–.546	–.525	.016	.529	.79	.691	.266	–	
12 Disappointment	–.237	–.387	–.243	–.456	–.499	.387	.252	.681	.554	.038	.595	–
	–.255	–.534	–.241	–.615	–.564	.313	.332	.778	.642	.125	.698	–
	–.159	–.442	–.25	–.568	–.536	.348	.357	.779	.742	.072	.695	–
M	2.78	3.50	2.62	2.97	2.62	2.82	2.01	2.21	1.60	2.40	1.44	2.20
	2.75	3.39	2.67	2.95	2.72	2.70	2.12	2.22	1.56	2.60	1.55	2.11
	2.68	3.42	2.71	2.90	2.70	2.96	2.29	2.22	1.58	2.58	1.56	2.04
SD	0.99	0.94	1.04	1.00	1.29	1.12	1.00	1.15	0.98	1.20	0.82	1.14
	1.03	1.01	1.05	1.04	1.02	1.09	1.07	1.16	0.96	1.24	0.93	1.10
	1.00	0.96	1.07	1.05	.980	1.13	1.09	1.18	0.95	1.28	0.93	1.01
Skewness	–.06	–.41	–.16	–.11	.24	–.11	.81	.59	1.60	.60	2.03	.56
	.05	–.59	–.07	–.32	.13	–.37	.59	.75	1.64	.32	1.82	.55
	.04	–.46	.04	–.05	.01	–.04	.32	.49	1.69	.33	1.73	.79

Table S1 *(continued)*

	1	2	3	4	5	6	7	8	9	10	11	12
Kurtosis	–.51	–.13	–.60	–.34	–.56	–.42	–.08	–.79	.94	–.15	1.14	–.37
	–.54	.07	–.81	–.67	–.47	–.71	–.38	–.34	1.76	–.59	2.97	–.60
	–.50	.04	–.74	–.67	–.63	–.78	–.62	–.36	2.25	–.91	2.52	.01
Alpha	.89	.87	.92	.90	.91	.84	.88	.94	.93	.95	.94	.95
	.92	.86	.92	.92	.90	.81	.89	.95	.95	.93	.96	.94
	.93	.87	.92	.93	.91	.87	.90	.95	.95	.96	.95	.93

Note. The correlation coefficients are correlations between factor scores derived from the emotion CFAs, disattenuated using Donald's ω (reported in Table S3). For Study 3, upper, middle, and lower coefficients are for Time 1, 2, and 3, respectively. For the original (not disattenuated) correlation coefficients, $p < .01$ for $|r| > .11$, .16, and .16 in Studies 1, 2, and 3, respectively. All *SE*s for the original coefficients were $\leq .055$, $\leq .065$, and $\leq .065$ in Studies 1, 2, and 3, respectively.

Table S2

Confirmatory Factor Analysis of Achievement Emotion Scales

Study	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	Factor loadings
					Enjoyment			
1	26.775	13	.013	.983	.964	.057	.031	.61–.78
2	19.122	13	.119	.990	.979	.045	.026	.48–.85
3 – T1	4.101	13	.000	.972	.940	.087	.029	.48–.88
3 – T2	34.713	13	.001	.982	.962	.082	.020	.51–.85
3 – T3	36.071	13	.001	.980	.957	.086	.020	.63–.85
					Hope			
1	12.632	2	.002	.976	.927	n /a	.030	.57–.83
2	.575	2	.750	1.000	1.000	n /a	.006	.60–.92
3 – T1	4.246	2	.120	.993	.980	n /a	.014	.72–.86
3 – T2	.976	2	.614	1.000	1.000	n /a	.007	.73–.83
3 – T3	2.888	2	.236	.997	.990	n /a	.012	.66–.89
					Pride			
1	6.533	4	.163	.996	.983	.044	.016	.42–.90
2	3.369	4	.498	1.000	1.000	.000	.005	.70–.89
3 – T1	4.255	4	.373	1.000	.999	.015	.008	.56–.94
3 – T2	5.697	4	.223	.997	.990	.041	.009	.55–.92
3 – T3	4.345	4	.036	1.000	.998	.019	.008	.57–.96
					Relaxation			
1	5.027	2	.081	.993	.963	n /a	.014	.73–.86
2	4.976	2	.083	.993	.963	n /a	.016	.70–.85
3 – T1	3.801	2	.150	.996	.981	n /a	.013	.77–.85
3 – T2	2.103	2	.350	1.000	.999	n /a	.009	.81–.90
3 – T3	4.015	2	.134	.997	.983	n /a	.011	.84–.91
					Assurance			
2	5.366	2	.068	.989	.966	n /a	.020	.77–.92
3 – T1	3.147	2	.207	.997	.992	n /a	.010	.82–.90
3 – T2	.900	2	.638	1.000	1.000	n /a	.006	.81–.86
3 – T3	1.082	2	.007	.977	.931	n /a	.019	.83–.87
					Relief			
1	.099	2	.952	1.000	1.000	n /a	.002	.43–.82
2	1.408	2	.495	1.000	1.000	n /a	.008	.56–.78
3 – T1	1.269	2	.530	1.000	1.000	n /a	.008	.51–.76
3 – T2	5.496	2	.064	.989	.947	n /a	.018	.53–.87
3 – T3	6.848	2	.033	.989	.947	n /a	.020	.66–.84

Table S2 *(continued)*

Study	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	Factor loadings
				Anger				
1	15.525	13	.276	.997	.993	.024	.019	.57–.84
2	29.266	13	.006	.974	.945	.073	.028	.57–.85
3 – T1	11.544	13	.565	1.000	1.000	.000	.014	.39–.83
3 – T2	28.214	13	.008	.983	.963	.068	.027	.34–.83
3 – T3	22.280	13	.051	.989	.976	.055	.022	.40–.89
				Anxiety				
1	27.263	11	.004	.990	.940	.067	.016	.56–.79
2	34.125	11	.000	.985	.913	.095	.020	.51–.87
3 – T1	19.006	11	.061	.996	.975	.051	.013	.50–.87
3 – T2	29.427	11	.002	.990	.940	.082	.016	.63–.86
3 – T3	22.507	11	.021	.993	.955	.066	.017	.57–.87
				Shame				
1	5.597	3	.133	.997	.985	.052	.008	.75–.89
2	4.867	3	.182	.997	.983	.052	.010	.76–.84
3 – T1	2.618	3	.454	1.000	1.000	.000	.008	.65–.97
3 – T2	1.986	3	.575	1.000	1.000	.000	.008	.74–.95
3 – T3	1.838	3	.601	1.000	1.000	.000	.004	.78–.91
				Boredom				
1	19.899	9	.019	.991	.971	.061	.018	.67–.86
2	11.628	9	.235	.996	.988	.035	.019	.64–.89
3 – T1	8.465	9	.488	1.000	1.000	.000	.010	.76–.87
3 – T2	7.638	9	.571	1.000	1.000	.000	.009	.72–.88
3 – T3	24.805	9	.026	.992	.976	.086	.014	.81–.88
				Hopelessness				
1	7.098	7	.419	1.000	1.000	.007	.009	.63–.85
2	11.569	7	.116	.995	.972	.053	.014	.68–.93
3 – T1	7.123	7	.416	1.000	.999	.008	.009	.71–.88
3 – T2	5.877	7	.554	1.000	1.000	.000	.011	.77–.95
3 – T3	14.163	7	.048	.991	.956	.066	.013	.71–.89
				Disappointment				
1	4.929	1	.026	.995	.950	n /a	.010	.73–.90
2	.591	1	.442	1.000	1.000	n /a	.005	.78–.92
3 – T1	1.877	1	.170	.998	.990	n /a	.007	.81–.98
3 – T2	.002	1	.962	1.000	1.000	n /a	.000	.80–.97
3 – T3	.518	1	.472	1.000	1.000	n /a	.004	.79–.96

Note. T1, T2, T3 = Time 1, Time 2, Time 3, respectively. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual. n/a = RMSEA not applicable due to low number of degrees of freedom (Kenny et al., 2015).

Table S3

McDonald's Omega and Factor Determinacy Indexes for Achievement Emotion Scores in Studies 1−3

	Omega derived from single CFAs [a]					Omega derived from ESEM [b]					Factor Determinacy Index				
	Study					Study					Study				
	1	2	3–T1	3–T2	3–T3	1	2	3–T1	3–T2	3–T3	1	2	3–T1	3–T2	3–T3
1 Enjoyment	.857	.869	.882	.913	.926	.865	.875	.889	.919	.931	.915	.949	.946	.949	.953
2 Hope	.800	.877	.874	.859	.872	.799	.870	.869	.861	.859	.917	.960	.940	.932	.947
3 Pride	.870	.926	.907	.917	.914	.867	.911	.912	.915	.918	.944	.965	.967	.963	.974
4 Relaxation	.892	.899	.909	.931	.937	.896	.904	.913	.932	.940	.969	.955	.964	.983	.984
5 Assurance	–	.885	.911	.904	.913	–	.827	.871	.849	.869		.952	.957	.952	.956
6 Relief	.789	.792	.797	.779	.855	.769	.789	.800	.795	.854	.905	.877	.882	.906	.917
7 Anger	.865	.883	.888	.892	.903	.825	.841	.637	.840	.846	.932	.937	.934	.943	.960
8 Anxiety	.907	.895	.930	.942	.934	.880	.831	.916	.930	.894	.930	.932	.970	.969	.964
9 Shame	.920	.913	.920	.941	.946	.842	.863	.937	.943	.947	.948	.943	.998	.979	.963
10 Boredom	.927	.908	.943	.940	.953	.922	.911	.928	.938	.952	.951	.959	.963	.965	.969
11 Hopelessness	.922	.939	.938	.952	.937	.780	.911	.916	.905	.896	.952	.975	.974	.986	.955
12 Disappointment	.897	.926	.948	.947	.928	.884	.914	.948	.933	.918	.948	.967	.984	.984	.974

Note. T = Time. [a] The coefficients are from the separate CFAs for the different emotions (reported in Table S2). [b] ESEMs were estimated separately for positive and negative emotions; see main manuscript, results sections in Studies 1–3.

Table S4

Confirmatory Factor Analysis: Multiple-Emotion Models, 1-Factor Models, and 2-Factor Models for Achievement Emotions

	Multiple-Emotion Model					*1-Factor Model*					*2-Factor Model*				
Study	χ^2 (*df*)	CFI	TLI	RMSEA / SRMR		χ^2 (*df*)	CFI	TLI	RMSEA / SRMR		χ^2 (*df*)	CFI	TLI	RMSEA / SRMR	
						Positive Emotions									
1	706.56 (322)	.902	.885	.060	.083	1666.97 (332)	.660	.613	.111	.134	1351.27 (331)	.740	.703	.097	.146
2	736.35 (431)	.928	.918	.055	.069	1713.47 (446)	.703	.670	.110	.114	1546.38 (445)	.742	.712	.103	.117
3 − T1	907.83 (431)	.913	.900	.063	.086	2586.17 (446)	.610	.566	.132	.164	2328.93 (445)	.657	.617	.124	.178
3 − T2	793.74 (431)	.928	.917	.058	.086	2187.22 (446)	.653	.614	.125	.155	1975.79 (445)	.695	.660	.117	.154
3 − T3	807.86 (431)	.930	.919	.061	.073	2382.51 (446)	.638	.598	.135	.163	2143.60 (445)	.683	.646	.127	.161
						Negative Emotions									
1	1641.69 (931)	.926	.914	.048	.055	2746.17 (946)	.813	.786	.076	.098	2744.74 (945)	.813	.786	.076	.098
2	1449.39 (931)	.927	.915	.049	.070	2387.36 (946)	.798	.769	.081	.103	2384.38 (945)	.798	.769	.081	.105
3 − T1	1536.28 (931)	.939	.929	.048	.075	3281.07 (946)	.765	.731	.094	.158	3830.61 (945)	.709	.667	.105	.290
3 − T2	1790.28 (931)	.912	.898	.061	.093	3115.76 (946)	.778	.747	.096	.142	3985.64 (945)	.689	.645	.113	.304
3 − T3	1716.08 (931)	.915	.901	.060	.079	2890.65 (946)	.789	.759	.093	.146	3481.10 (945)	.725	.686	.106	.283

Note. T1, T2, T3 = Time 1, Time 2, Time 3, respectively. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

2. Study 2 Supplemental Analyses

Achievement Emotions and Achievement Motivation

To examine the discriminant validity of the emotion scales relative to constructs of achievement motivation, we analyzed their relations with the fear of failure motive and with achievement goals related to the current course. Fear of failure was assessed as part of the baseline questionnaire with Thrash and Elliot's (2003) short version of Herman's (1990) fear of failure scale (9 items; e.g., "I often avoid a task because I am afraid that I will make mistakes"; 1 = *strongly disagree* to 5 = *strongly agree*). The construct represents a general tendency to experience fear of failing when performing tasks. Achievement goals were assessed three weeks into the semester with Elliot and Murayama's (2008) Achievement Goal Questionnaire-Revised assessing performance-approach goals (3 items; e.g., "My goal is to perform better than the other students"), performance-avoidance goals (3 items; e.g., "My goal is to avoid performing poorly compared to others"), mastery-approach goals (3 items; e.g., "My goal is to learn as much as possible"), and mastery-avoidance goals (3 items; e.g., "My goal is to avoid learning less than it is possible to learn); response scale 1 = *not all true for me* to 5 = *extremely true for me*.

We used SEM with Mplus 8.6 (Muthén & Muthén, 2017) to analyze correlations between the emotions and the fear of failure and achievement goal measures. In separate models for the 12 emotions, we used the MLR estimator to estimate parameters, and full information maximum likelihood to deal with missing data. As can be seen from Table S5, all models fit the data well.

Fear of failure correlated with the failure-related outcome emotions anxiety and shame more strongly than with the negative activity emotions (anger, boredom). All of the four pairwise comparisons between correlations of fear of failure with the two failure emotions, on the one hand, and the two activity emotions, on the other, were significant (ps < .001). Furthermore, there also were clear links between achievement goals and achievement emotions. Performance-approach and performance-avoidance goals related to positive and negative outcome emotions, respectively. Specifically, performance-approach goals correlated with pride, and performance-avoidance goals correlated with anxiety, shame, hopelessness, and disappointment. Both mastery-approach and master-avoidance goals related to activity emotions in terms of positive correlations with enjoyment and negative correlations with boredom. These relations are largely consistent with prior theory and evidence (e.g., Pekrun et al., 2009). Overall, the correlations were weak to moderate, suggesting that achievement emotions are empirically separable from fear of failure and achievement goals.

Herman, W. E. (1990). Fear of failure as a distinctive personality trait measure of test anxiety. *Journal of Research & Development in Education, 23*(3), 180–185.

Elliot, A. J., & Murayama, K. (2008). On the measurement of achievement goals: Critique, illustration, and application. *Journal of Educational Psychology, 100*(3), 613–628. https://doi.org/10.1037/0022-0663.100.3.613

Pekrun, R., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology, 101*(1), 115–135. https://doi.org/10.1037/a0013383

Thrash, T., & Elliot, A. J. (2003). Inspiration as a psychological construct. *Journal of Personality and Social Psychology, 84*(4), 871–889. https://doi.org/10.1037/0022-3514.84.4.871

Table S5

Achievement Emotions, Fear of Failure, and Achievement Goals: Model Fit and Latent Correlations

								Latent Correlations									
								Fear of failure		PAP		PAV		MAP		MAV	
	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	ρ	*SE*	ρ	*SE*	ρ	*SE*	ρ	*SE*	ρ	*SE*
Enjoyment	467.258	328	.000	.948	.940	.043	.064	**–.354**	.078	.019	.078	–.056	.083	**.412**	.078	**.237**	.094
Hope	358.381	237	.000	.948	.940	.047	.060	**–.437**	.059	.135	.080	–.044	.078	**.271**	.075	.057	.080
Pride	382.688	279	.000	.963	.957	.040	.058	**–.170**	.077	**.250**	.075	.128	.085	**.220**	.072	.023	.082
Relaxation	359.889	257	.000	.957	.950	.041	.058	**–.431**	.077	.074	.080	–.097	.075	.126	.078	–.044	.079
Assurance	342.584	237	.000	.953	.945	.044	.059	**–.394**	.068	.098	.079	–.047	.079	.084	.087	–.127	.089
Relief	360.377	257	.000	.952	.944	.041	.062	**.211**	.096	**.253**	.091	**.391**	.084	.026	.092	.103	.098
Anger	519.072	328	.000	.930	.920	.050	.059	**.279**	.082	.027	.083	.089	.084	**–.236**	.084	–.133	.096
Anxiety	548.251	406	.000	.957	.948	.039	.056	**.605**	.070	.058	.082	**.219**	.077	–.013	.084	.114	.092
Shame	393.790	279	.000	.958	.951	.042	.057	**.561**	.065	.148	.075	**.283**	.069	–.099	.080	.065	.088
Boredom	458.235	324	.000	.952	.944	.042	.062	**.184**	.082	.142	.078	.136	.078	**–.291**	.075	**–.209**	.084
Hopelessness	496.224	342	.000	.954	.946	.044	.057	**.361**	.063	.043	.078	**.172**	.067	**–.203**	.076	.031	.079
Disappointment	339.595	236	.000	.957	.950	.043	.059	**.358**	.074	.090	.074	**.152**	.072	–.052	.075	.003	.080

Note. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual. PAP, PAV, MAP, MAV: Performance-approach, performance-avoidance, master-approach, and mastery-avoidance goals, respectively. **Bold** coefficients: $p < .05$.

Table S6

Confirmatory Factor Analysis of Scales for Personality, Achievement Behavior, and Performance (Study 2)

	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	Factor loadings
					Personality			
Neuroticism	82.602	44	.000	.952	.928	.061	.044	.31–.83
Extraversion	99.331	43	.000	.907	.857	.075	.053	.22–.73
Openness	72.384	46	.008	.937	.910	.049	.050	.10–.77
Agreeableness	69.643	35	.000	.933	.873	.065	.044	.30–.69
Conscientiousness	113.313	42	.000	.910	.859	.085	.053	.40–.73
					Achievement behavior			
Irrelevant thinking	65.147	32	.001	.971	.959	.067	.027	.65–.90
Effort	6.203	1	.013	.965	n/a	n/a	.021	.30–.95
Elaboration	15.043	7	.035	.976	.948	.070	.035	.41–.72
Critical thinking	5.161	3	.160	.995	.983	.055	.016	.73–.80
Rehearsal	5.428	2	.066	.961	n/a	n/a	.034	.40–.84
Self–regulation	.195	1	.659	1.000	n/a	n/a	.002	.68–.83
External regulation [a]	.000	0	n/a	1.000	n/a	n/a	.000	.48–.89
					Performance			
Course performance [a]	.000	0	n/a	1.000	n/a	n/a	.000	.83–.90

Note. [a] Saturated model. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual. n/a = TLI and RMSEA not applicable due to low degrees of freedom. In the personality trait CFAs, we followed the strategy proposed by Marsh et al. (2010) and represented facet membership of items by correlated uniqueness within each of the five CFA models. The relatively low values especially for TLI are in line with previous analyses of Big Five inventories suggesting that the dimensionality of the traits is complex, due to the broad range of dispositions represented in each of them (see Marsh et al., 2010).

Table S7

Latent Correlations of Achievement Emotions with Personality and Demographic Variables (Study 2)

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
Personality															
Neuroticism	3.12	1.19	.87	**−.170**	**−.269**	−.155	**−.338**	**−.333**	.190	**.369**	**.612**	**.520**	**.320**	**.529**	**.313**
				(.079)	(.073)	(.080)	(.075)	(.074)	(.098)	(.071)	(.067)	(.060)	(.081)	(.053)	(.073)
Extraversion	3.27	1.09	.81	.154	.133	**.247**	.114	**.258**	.105	−.033	−.003	.069	−.037	−.080	.097
				(.091)	(.078)	(.083)	(.089)	(.081)	(.101)	(.091)	(.090)	(.083)	(.088)	(.079)	(.079)
Openness	3.50	1.12	.75	.052	.145	.072	.105	.163	.139	−.106	−.100	−.065	.008	−.073	−.053
				(.109)	(.083)	(.081)	(.083)	(.084)	(.100)	(.082)	(.100)	(.080)	(.096)	(.086)	(.082)
Agreeableness	3.57	1.07	.81	.037	.215	.115	.019	.028	**.215**	**−.251**	.122	−.101	**−.272**	−.101	−.121
				(.091)	(.084)	(.095)	(.091)	(.086)	(.097)	(.088)	(.098)	(.079)	(.089)	(.081)	(.087)
Conscientiousness	3.60	1.01	.83	**.218**	.246	**.285**	**.264**	**.292**	.097	**−.224**	−.147	−.137	−.038	**−.222**	**−.166**
				(.087)	(.079)	(.078)	(.080)	(.078)	(.092)	(.083)	(.099	(.073)	(.084)	(.070)	(.074)
Demographic variables															
Gender	1.55	0.50	−	.024	−.018	−.024	−.110	−.200	**.092**	−.129	**.261**	**.161**	−.125	.021	.112
				(.072)	(.069)	(.070)	(.068)	(.066)	(.024)	(.071)	(.075)	(.066)	(.072)	(.068)	(.067)
Age	19.36	1.35	−	−.056	.066	−.017	.109	.036	−.144	.046	−.128	−.108	−.014	.087	−.058
				(.081)	(.100)	(.067)	(.080)	(.082)	(.067)	(.092)	(.084)	(.083)	(.067)	(.097)	(.066)
SAT	651.34	88.91	.76	**.196**	.072	.059	.099	**.156**	.075	.002	.064	.035	−.049	−.058	−.056
				(.064)	(.069)	(.063)	(.069)	(.069)	(.040)	(.076)	(.085)	(.077)	(.082)	(.074)	(.069)

Note. Gender is coded 1 = male , 2 = female. SAT = Scholastic Aptitude Test. Coefficients are latent correlations. Standard errors are in parentheses. $p < .05$. and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S8

Fit of Structural Equation Models for Achievement Emotions and Performance (Study 2)

Model	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR
Enjoyment	117.657	89	.023	.979	.971	.037	.049
Hope	46.130	46	.467	1.000	1.000	.003	.044
Pride	63.927	64	.479	1.000	1.000	.000	.040
Relaxation	66.290	54	.122	.989	.984	.031	.041
Assurance	66.223	46	.027	.980	.971	.043	.049
Relief	7.745	56	.089	.984	.978	.034	.052
Anger	147.293	89	.000	.956	.942	.053	.052
Anxiety	221.152	121	.000	.956	.931	.059	.063
Shame	7.551	65	.298	.996	.994	.019	.044
Boredom	12.360	87	.010	.981	.973	.040	.049
Hopelessness	145.292	91	.000	.970	.956	.050	.051
Disappointment	65.083	47	.041	.987	.981	.041	.052
Positive and negative affect	236.147	127	.000	.943	.915	.061	.051

Note. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Table S9

Latent Correlations of Achievement Emotions with Learning Strategies and Achievement (Study 2)

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
Achievement behavior															
Irrelevant thinking	2.29	1.24	.95	**–.173**	**–.243**	**–.220**	**–.199**	**–.212**	–.042	**.386**	**.385**	**.408**	**.413**	**.360**	**.296**
				(.070)	(.069)	(.075)	(.073)	(.072)	(.096)	(.069)	(.074)	(.071)	(.062)	(.073	(.071
Effort	3.69	1.06	.68	**.233**	**.516**	**.483**	**.348**	**.456**	**.506**	**–.205**	–.084	–.109	–.143	**–.278**	–.158
				(.088)	(.085)	(.078)	(.082)	(.076)	(.112)	(.094)	(.109)	(.091)	(.103)	(.088	(.086)
Elaboration	3.25	1.21	.80	**.378**	**.264**	**.210**	.144	.116	.152	**–.241**	.066	.069	**–.197**	–.121	.003
				(.083)	(.081)	(.084)	(.096)	(.088)	(.114)	(.100)	(.089)	(.095)	(.091)	(.077	(.090)
Critical thinking	3.09	1.17	.88	**.377**	**.226**	.108	.129	.138	.194	**–.190**	.105	.054	**–.178**	.013	.028
				(.082)	(.076)	(.082)	(.089)	(.079)	(.094)	(.091)	(.092)	(.085)	(.085)	(.074	(.079)
Rehearsal	3.71	1.12	.64	**.284**	**.342**	**.355**	**.246**	**.211**	**.492**	**–.246**	.048	.009	–.116	–.098	–.045
				(.065)	(.076)	(.078)	(.082)	(.083)	(.082)	(.089)	(.087)	(.087)	(.080)	(.089	(.082)
Self-regulation	3.57	1.04	.84	**.464**	**.737**	**.529**	**.543**	**.594**	**.356**	**–.412**	**–.303**	**–.204**	**–.173**	**–.399**	**–.202**
				(.070)	(.049)	(.082)	(.063)	(.069)	(.118)	(.076)	(.099)	(.093)	(.086)	(.080	(.099)
External regulation	2.52	1.13	.64	.141	–.173	.035	–.053	–.044	–.016	**.311**	**.322**	**.276**	.108	**.321**	**.259**
				(.118)	(.106)	(.104)	(.101)	(.095)	(.170)	(.115)	(.095)	(.092)	(.108)	.100	(.089)
Performance															
Course performance	80.40	14.08	.89	**.190**	**.485**	**.218**	**.312**	**.357**	.037	**−.268**	**−.317**	**−.253**	−.134	**−.359**	**−.341**
				(.073)	(.069)	(.076)	(.072)	(.075)	(.098)	(.076)	(.108)	(.080)	(.082)	(.077)	(.072)

Note. Coefficients are latent correlations. Standard errors are in parentheses. $p < .05$. and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S10

Structural Equation Model for Positive Affect, Negative Affect, and Performance (Study 2): Factor Loadings, Path Coefficients, and Residual Variances

	Positive Affect		*Negative Affect*		*Course performance*	
Factor loadings	.40−.79		.40−.91		.76−.97	
	ß	*SE*	ß	*SE*	ß	*SE*
Effects of affect						
Positive affect	–	–	–	–	**.290**	.084
Negative affect	–	–	–	–	**–.265**	.079
Effects of covariates						
Gender	−.082	.075	.114	.070	**.166**	.059
Age	−.001	.073	–.060	.069	.058	.059
SAT	**.169**	.083	.006	.081	**.241**	.074
Residual Variances	.965		.982		.682	

Note. Factor loadings, path coefficients, and residual variances are standardized coefficients. Gender is coded 1= male, 2 = female. $p < .05$, 01, and .001 for ß > 1.96, 2.58, and 3.29 *SE* , respectively. **Bold** path coefficients: $p < .05$.

Personality Traits and Achievement Emotions as Predictors of Course Performance

We added a supplemental analysis to the analysis of emotions and course performance. In the main analysis of emotions as predictors of performance, students' gender, age, and SAT scores were included as covariates (Table 5, main manuscript). In the supplemental analysis, we additionally included the Big 5 traits assessed at the beginning of the semester (neuroticism, extraversion, openness, agreeableness, and conscientiousness). Including the traits made it possible to examine if emotions predict performance over and above the influence of personality (Table S11). The results show that emotions continued to significantly predict performance in nine of the 12 emotion models. As in the main analysis, the prospective emotions hope, assurance, anxiety, and hopelessness were especially strong positive and negative predictors, respectively.

Among the personality traits, conscientiousness was a significant positive predictor across all models. In addition, openness tended to negatively predict performance; the coefficients were significant in seven of the 12 models. In interpreting these coefficients, it needs to be considered that openness related positively to students' SAT scores (average $\rho = .43$ across models), which, in turn, related positively to their course performance (ß range .22 to .31; Table S11). The pattern of relations suggests that openness has positive indirect effects on performance mediated by SAT scores, and negative direct effects. The overall correlations between openness and performance were near zero (average $\rho = -.04$ across models), in line with the weak correlation in the meta-analysis reported by Richardson et al. (2012; $\rho = .09$).

Neuroticism was not a significant predictor of course performance in nine of the models, but was a significant positive predictor in the anxiety, shame, and hopelessness models. Caution should be exercised in interpreting these model-specific effects. They were likely driven by multicollinearity between neuroticism and each of these three negative emotions ($\rho = .61, .52,$ and .52 for anxiety, shame, and hopelessness, respectively; Table S7; see also Table 4 in the main manuscript).

Table S11

Emotions and Personality Traits as Predictors of Course Performance: Structural Equation Models (Study 2)

Predictor	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
	Enjoyment		*Hope*		*Pride*		*Relaxation*		*Assurance*		*Relief*	
Emotion	.067	.095	**.417**	.080	**.199**	.075	**.257**	.089	**.316**	.105	–.058	.094
Neuroticism	–.008	.080	.080	.076	.002	.078	.071	.083	.065	.087	.007	.080
Extraversion	–.093	.098	–.101	.085	–.124	.090	–.065	.109	–.127	.105	–.062	.091
Openness	–.130	.120	**–.207**	.094	–.177	.101	–.208	.106	**–.208**	.110	–.193	.102
Agreeableness	.151	.082	.075	.077	.124	.080	.154	.079	.146	.080	.159	.083
Conscientiousness	**.278**	.080	**.220**	.068	**.245**	.072	**.239**	.073	**.223**	.080	**.306**	.073
Gender	–.012	.070	.029	.065	.028	.068	.020	.079	.064	.080	.003	.072
Age	.048	.078	.031	.087	.050	.080	.038	.082	.054	.077	.047	.078
SAT	**.293**	.132	**.222**	.097	**.249**	.100	**.275**	.176	**.230**	.159	**.301**	.105
R^2	**.231**	.080	**.352**	.079	**.235**	.064	**.265**	.093	**.293**	.076	**.213**	.070
	Anger		*Anxiety*		*Shame*		*Boredom*		*Hopelessness*		*Disappointment*	
Emotion	**–.217**	.099	**–.572**	.134	**–.377**	.082	–.074	.083	**–.403**	.104	**–.367**	.070
Neuroticism	.082	.090	**.377**	.132	**.210**	.090	.018	.083	**.228**	.103	.114	.076
Extraversion	–.027	.118	.054	.087	.027	.086	–.071	.089	–.024	.096	–.010	.082
Openness	**–.229**	.116	**–.272**	.095	**–.225**	.096	–.186	.102	**–.225**	.109	**–.180**	.090
Agreeableness	.121	.079	**.220**	.085	.115	.076	.129	.082	.154	.079	.098	.074
Conscientiousness	**.266**	.076	**.213**	.076	**.257**	.067	**.298**	.074	**.242**	.072	**.237**	.064
Gender	–.034	.080	.059	.070	.045	.066	–.002	.070	–.017	.071	.054	.066
Age	.079	.081	.031	.073	.034	.085	.051	.078	.117	.082	.044	.069
SAT	**.312**	.190	**.263**	.093	**.277**	.093	**.284**	.105	**.246**	.100	**.227**	.095
R^2	**.251**	.108	**.366**	.086	**.293**	.068	**.207**	.072	**.318**	.013	**.306**	.058

Note. Gender is coded 1 = male, 2 = female. SAT = Scholastic Aptitude Test. $p < .05$, .01, and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively.

Bold coefficients: $p < .05$.

3. Study 3 Supplementary Analyses

Table S12

Confirmatory Factor Analysis of Scales for Appraisals, Perceptions of Instruction, and Health Problems (Study 3)

	Time	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	Factor loadings
					Appraisals				
Perceived control	1	14.363	12	.278	.991	.985	.027	.032	.49–.63
	2	26.158	12	.010	.964	.937	.068	.035	.45–.75
	3	21.970	12	.038	.976	.957	.059	.033	.54–.67
Intrinsic value [a]	1	.000	0	n/a	1.000	1.000	.000	.000	.84–.92
	2	.000	0	n/a	1.000	1.000	.000	.000	.89–.93
	3	.000	0	n/a	1.000	1.000	.000	.000	.91–.92
					Perceptions of Instruction				
Clarity	1	.000	0	n/a	1.000	1.000	.000	.000	.79–.87
	2	.000	0	n/a	1.000	1.000	.000	.000	.65–.95
	3	.000	0	n/a	1.000	1.000	.000	.000	.72–.87
Difficulty	1	.000	0	n/a	1.000	1.000	.000	.000	.65–.80
	2	.000	0	n/a	1.000	1.000	.000	.000	.66–.84
	3	.000	0	n/a	1.000	1.000	.000	.000	.62–.91
Discussion	1	.000	0	n/a	1.000	1.000	.000	.000	.72–.84
	2	.000	0	n/a	1.000	1.000	.000	.000	.75–.89
	3	.000	0	n/a	1.000	1.000	.000	.000	.82–.88
Enthusiasm	1	.000	0	n/a	1.000	1.000	.000	.000	.73–.90
	2	.000	0	n/a	1.000	1.000	.000	.000	.88–.93
	3	.000	0	n/a	1.000	1.000	.000	.000	.68–.98
Rapport	1	.000	0	n/a	1.000	1.000	.000	.000	.65–.92
	2	.000	0	n/a	1.000	1.000	.000	.000	.61–.95
	3	.000	0	n/a	1.000	1.000	.000	.000	.61–.91
					Health				
Health problems	1	39.083	31	.151	.988	.983	.031	.034	.43–.66
	2	56.093	31	.004	.965	.949	.057	.036	.57–.67
	3	52.646	31	.009	.967	.952	.054	.040	.52–.63

Note. [a] Saturated model. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual. n/a = RMSEA not applicable because model is saturated.

Table S13

Autoregressive Structural Equation Models for Achievement Emotions and Health Problems (Study 3)

								Stability coefficients	
Model	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	T1 → T2	T2 → T3
Enjoyment	358.328	205	.000	.965	.953	.048	.038	.88	.87
Hope	79.285	40	.000	.970	.951	.055	.066	.74	.72
Pride	125.864	100	.041	.992	.987	.028	.052	.80	.71
Relaxation	81.456	64	.070	.993	.988	.029	.032	.74	.71
Assurance	6.325	40	.021	.988	.980	.040	.042	.79	.80
Relief	13.583	64	.000	.962	.937	.057	.057	.84	.79
Anger	342.891	205	.000	.960	.947	.046	.077	.87	.86
Anxiety	768.815	427	.000	.951	.928	.050	.046	.87	.91
Shame	11.829	97	.160	.994	.991	.021	.037	.88	.84
Boredom	344.644	193	.000	.971	.958	.049	.036	.84	.82
Hopelessness	403.680	235	.000	.958	.937	.047	.054	.83	.81
Disappointment	66.115	37	.002	.987	.977	.049	.055	.76	.75
Health problems	236.147	127	.000	.943	.915	.061	.051	.90	.92

Note. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Table S14

Latent Correlations of Achievement Emotions with Appraisals (Study 3)

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
								Time 1							
Perceived control	3.69	0.89	.76	**.338**	**.497**	**.197**	**.539**	**.450**	–.093	**–.298**	**–.509**	**–.391**	–.113	**–.527**	**–.503**
				(.081)	(.079)	(.084)	(.068)	(.073)	(.111)	(.092)	(.069)	(.068)	(.086)	(.069)	(.068)
Unexpected success	2.68	0.91	–	**.314**	.100	**.343**	**.210**	.028	**.262**	**–.316**	–.092	–.094	**–.300**	**–.173**	**–.166**
				(.066)	(.069)	(.068)	(.068)	(.069	(.074)	(.063)	(.063)	(.059)	(.063)	(.064)	(.061)
Unexpected failure	2.38	0.91	–	**–.179**	**–.167**	–.076	**–.384**	**–.304**	**.139**	.093	**.342**	**.279**	.004	**.313**	**.400**
				(.068)	(.071)	(.068)	(.059)	(.061)	(.068)	(.071)	(.066)	(.064)	(.071)	(.079)	(.061)
Intrinsic value	3.50	1.01	.92	**.790**	**.234**	**.308**	**.413**	.111	**.248**	**–.706**	**–.208**	**–.147**	**–.646**	**–.305**	**–.198**
				(.031)	(.060)	(.066)	(.062)	(.064)	(.075)	(.041)	(.061)	(.058)	(.042)	(.051)	(.057)
Value of success	3.58	0.98		**.295**	**.145**	**.145**	.019	–.056	**.365**	**–.200**	**.178**	.085	**–.142**	–.005	.102
				(.065)	(.066)	(.065)	(.073)	(.067)	(.070)	(.069)	(.059)	(.059)	(.064)	(.066)	(.066)
Value of failure	3.65	1.07		–.096	.089	–.098	**–.176**	**–.175**	**.204**	.109	**.242**	**.135**	.083	.015	**.209**
				(.067)	(.067)	(.069)	(.065)	(.067)	(.074)	(.066)	(.060)	(.057)	(.061)	(.061)	(.058)
								Time 2							
Perceived control	3.79	0.85	.80	**.251**	**.560**	**.239**	**.551**	**.479**	.017	**–.372**	**–.586**	**–.389**	–.083	**–.622**	**–.494**
				(.101)	(.113)	(.083)	(.096	(.096)	(.097)	(.079)	(.082)	(.077)	(.086)	(.065)	(.086)
Unexpected success	2.78	0.96	–	**.406**	**.392**	**.396**	**.304**	**.158**	**.278**	**–.332**	**–.215**	**–.176**	**–.327**	**–.286**	**–.180**
				(.061)	(.058)	(.065)	(.066)	(.070)	(.082)	(.068)	(.069)	(.070)	(.065)	(.065)	(.070)
Unexpected failure	2.38	0.93	–	**–.267**	**–.333**	–.127	**–.450**	**–.339**	**.207**	**.379**	**.528**	**.298**	.089	**.441)**	**.532**
				(.064)	(.073)	(.072)	(.058)	(.069)	(.079)	(.063)	(.058)	(.070)	(.067)	(.066)	(.056)
Intrinsic value	3.40	1.04	.94	**.836**	**.325**	**.355**	**.460**	**.147**	**.218**	**–.818**	**–.321**	**–.180**	**–.610**	**–.388**	**–.270**
				(.030)	(.068)	(.070)	(.056)	(.068)	(.083)	(.030	(.064)	(.060)	(.056)	(.060)	(.062)
Value of success	3.00	0.96	–	**.312**	**.238**	**.233**	.024	–.018	**.402**	**–.249**	.050	.079	**–.263**	–.090	.042
				(.072)	(.071)	(.075)	(.068)	(.069)	(.065)	(.071)	(.067)	(.066)	(.072)	(.065)	(.067)
Value of failure	3.70	1.10	–	–.121	.025	–.023	**–.243**	–.130	**.200**	**.145**	**.214**	**.138**	.099	.083	**.146**
				(.069)	(.073)	(.072)	(.062)	(.070)	(.074)	(.071)	(.063)	(.058)	(.069)	(.062)	(.061)

Table S14 *(continued)*

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
								Time 3							
Perceived control	3.80	0.84	.81	**.305**	**.693**	**.241**	**.577**	**.489**	–.041	**–.501**	**–.650**	**–.471**	–.123	**–.743**	**–.642**
				(.079)	(.056)	(.076)	(.059)	(.074)	(.095)	(.070)	(.067)	(.077)	(.081)	(.049)	(.060)
Unexpected success	2.74	0.87	–	**.338**	**.263**	**.372**	**.173**	**.146**	**.274**	**–.252**	–.091	–.110	**–.289**	**–.204**	–.110
				(.066)	(.075)	(.064	(.077)	(.070)	(.072)	(.075)	(.078)	(.073)	(.069)	(.076)	(.072)
Unexpected failure	2.43	0.92	–	**–.249**	**–.359**	–.067	**–.466**	**–.346**	**.205**	**.348**	**.515**	**.457**	.115	**.521**	**.539**
				(.067)	(.073)	(.073)	(.062)	(.067)	(.076)	(.065)	(.059)	(.061)	(.070)	(.059)	(.054)
Intrinsic value	3.39	1.05	.94	**.810**	**.311**	**.343**	**.455**	**.284**	**.159**	**–.820**	**–.355**	**–.198**	**–.701**	**–.402**	**–.213**
				(.032)	(.072)	(.065)	(.062)	(.066)	(.078)	(.032)	(.070)	(.069)	(.047)	(.069)	(.066)
Value of success	3.07	0.97	–	**.330**	**.170**	**.175**	.008	.018	**.294**	**–.205**	.092	.102	**–.248**	–.035	**.170**
				(.064)	(.077)	(.068)	(.077)	(.074)	(.065)	(.072)	(.072)	(.072)	(.068)	(.075)	(.065)
Value of failure	3.63	1.09	–	.049	.130	–.028	–.091	–.030	**.194**	–.028	.125	**.130**	–.013	–.001	**.128**
				(.074)	(.074)	(.076)	(.073)	(.072)	(.071	(.071)	(.067)	(.055)	(.073)	(.064)	(.060)

Note. Coefficients are latent correlations. Standard errors are in parentheses. $p < .05$. and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S15

Appraisals as Predictors of Achievement Emotions: Latent Multiple Regression Analysis (Study 3, Time 2–3)

Predictor	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
	Enjoyment		*Hope*		*Pride*		*Relaxation*		*Assurance*		*Relief*	
Perceived control	–.095	.095	**.396**	.117	.046	.081	**.322**	.096	**.342**	.098	–.019	.090
Unexpected success	**.136**	.066	.149	.090	**.228**	.079	.074	.082	.064	.084	.116	.087
Intrinsic value	**.587**	.064	.008	.107	.157	.086	**.298**	.086	.104	.085	.008	.086
Value of success	**.192**	.061	.031	.085	.096	.083	–.102	.075	–.056	.081	**.299**	.067
Gender	**.135**	.058	.006	.066	**.141**	.069	.038	.058	**.175**	.068	–.006	.070
Age	**.192**	.052	.033	.053	.024	.065	.059	.064	.084	.056	–.081	.086
GPA	–.082	.057	–.077	.037	–.037	.057	–.075	.043	–.060	.031	–.029	.063
R^2	**.535**	.063	**.220**	.084	**.137**	.045	**.284**	.067	**.212**	.067	**.124**	.044
	Anger		*Anxiety*		*Shame*		*Boredom*		*Hopelessness*		*Disappointment*	
Perceived control	**–.178**	.082	**–.362**	.111	**–.345**	.109	.023	.085	**–.408**	.112	**–.335**	.119
Unexpected failure	.034	.065	**.272**	.088	.062	.098	–.143	.080	.139	.101	**.276**	.090
Intrinsic value	**–.654**	.056	–.083	.086	–.045	.076	**–.549**	.077	**–.170**	.081	.009	.082
Value of failure	.004	.054	**.147**	.059	.106	.067	–.016	.068	.037	.062	.092	.067
Gender	.035	.061	.005	.060	–.033	.055	–.002	.064	.058	.069	–.060	.058
Age	**–.155**	.046	.010	.063	.024	.087	**–.207**	.061	–.042	.057	–.049	.048
GPA	.083	.062	–.017	.037	–.011	.028	.014	.038	–.009	.038	–.004	.030
R^2	**.610**	**.052**	**.366**	**.063**	**.172**	**.058**	**.328**	**.074**	**.340**	**.067**	**.302**	**.070**

Note. Betas are standardized coefficients. Gender is coded 1= male, 2 = female. *SE* = standard error. $p < .05$, 01, and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S16

Latent Correlations of Achievement Emotions with Perceived Instruction (Study 3)

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
								Time 1							
Stimulation	3.38	0.95	–	**.537**	.024	.108	.139	**–.239**	**.321**	**–.468**	**.143**	.063	**–.593**	–.025	**.163**
				(.052)	(.065)	(.056)	(.070)	(.061)	(.071)	(.063)	(.064)	(.057)	(.080)	(.059)	(.063)
Clarity	3.90	0.91	.82	**.385**	**.313**	.086	**.460**	**.169**	–.028	**–.382**	**–.287**	**–.298**	**–.294**	**–.388**	**–.413**
				(.066)	(.091)	(.049)	(.070)	(.079)	(.086)	(.078)	(.080)	(.079)	(.065)	(.093)	(.070)
Difficulty	3.21	0.73	.79	–.058	**–.337**	–.036	**–.451**	**–.455**	**.276**	.101	**.492**	**.299**	**–.133**	**.430**	**.501**
				(.072)	(.081)	(.036)	(.063)	(.058)	(.073)	(.093)	(.064)	(.074)	(.059)	(.070)	(.062)
Discussion	3.88	0.95	.84	**.270**	**.187**	.074	**.310**	.029	.011	**–.220**	–.130	**–.143**	**–.189**	**–.201**	**–.228**
				(.075)	(.069)	(.048)	(.066)	(.070)	(.080)	(.068)	(.064)	(.060)	(.061)	(.066)	(.066)
Enthusiasm	3.65	1.06	.87	**.605**	.119	**.126**	**.327**	–.079	**.234**	**–.511**	.019	–.074	**–.493**	–.111	–.071
				(.049)	(.076)	(.048)	(.069)	(.077)	(.078)	(.069)	(.071)	(.062)	(.068)	(.062)	(.070)
Rapport	4.35	0.82	.78	**.209**	**.288**	.012	**.299**	.110	.092	**–.231**	**–.204**	**–.247**	–.063	**–.340**	**–.209**
				(.068)	(.081)	(.023)	(.072)	(.076)	(.074)	(.086)	(.077)	(.072)	(.030)	(.081)	(.072)
								Time 2							
Stimulation	3.39	0.96	–	**.615**	**.177**	**.286**	.114	–.080	**.354**	**–.480**	–.003	–.037	**–.621**	–.120	.020
				(.043)	(.082)	(.061)	(.074)	(.079)	(.070)	(.078)	(.071)	(.060)	(.045)	(.069)	(.066)
Clarity	3.75	1.04	.84	**.551**	**.419**	**.264**	**.563**	**.265**	–.021	**–.476**	**–.444**	**–.342**	**–.492**	**–.515**	**–.422**
				(.051)	(.075)	(.078)	(.057)	(.079)	(.096)	(.065)	(.073)	(.081)	(.063)	(.066)	(.065)
Difficulty	3.20	0.76	.80	–.110	**–.421**	–.146	**–.578**	**–.508**	**.264**	**.125**	**.576**	**.310**	–.149	**.480**	**.482**
				(.068)	(.081)	(.075)	(.056)	(.060)	(.084)	(.051)	(.060)	(.078)	(.079)	(.067)	(.056)
Discussion	4.02	0.87	.85	**.248**	**.220**	**.161**	**.256**	.083	.086	**–.174**	**–.211**	**–.234**	**–.185**	**–.293**	**–.169**
				(.062)	(.068)	(.071)	(.061)	(.065)	(.079)	(.051)	(.072)	(.064)	(.068)	(.074)	(.067)
Enthusiasm	3.59	1.10	.89	**.598**	.096	**.190**	**.301**	.043	.141	**–.361**	**–.170**	–.152	**–.637**	**–.196**	**–.198**
				(.050)	(.077)	(.081)	(.069)	(.077)	(.079)	(.062)	(.073)	(.077)	(.050)	(.069)	(.073)
Rapport	4.38	0.81	.78	**.187**	**.337**	.086	**.266**	.101	.129	**–.139**	**–.373**	**–.336**	**–.170**	**–.465**	**–.338**
				(.062)	(.069)	(.063)	(.067)	(.065)	(.088)	(.038)	(.065)	(.072)	(.070)	(.081)	(.062)

Table S16 *(continued)*

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
								Time 3							
Stimulation	3.36	0.96	–	**.577**	**.175**	**.325**	**.191**	.077	**.299**	**–.553**	–.130	**–.148**	**–.645**	**–.272**	–.071
				(.054)	(.071)	(.063)	(.080)	(.075)	(.078)	(.053)	(.075)	(.069)	(.041)	(.060)	(.070)
Clarity	3.75	1.00	.83	**.548**	**.392**	**.338**	**.529**	**.356**	.027	**–.630**	**–.471**	**–.355**	**–.570**	**–.518**	**–.388**
				(.062)	(.078)	(.074)	(.063)	(.071)	(.085)	(.055)	(.074)	(.087)	(.063)	(.074)	(.077)
Difficulty	3.15	0.75	.77	–.137	**–.424**	–.141	**–.508**	**–.456**	.151	**.257**	**.589**	**.446**	–.132	**.525**	**.549**
				(.082)	(.065)	(.071)	(.053)	(.061)	(.088)	(.089)	(.061)	(.075)	(.079)	(.065)	(.056)
Discussion	3.88	0.91	.88	**.296**	**.220**	**.168**	**.327**	.153	.076	**–.380**	**–.229**	**–.213**	**–.320**	**–.237**	**–.235**
				(.064)	(.075)	(.078)	(.065)	(.074)	(.082)	(.070)	(.079)	(.076)	(.066)	(.072)	(.073)
Enthusiasm	3.61	1.08	.86	**.631**	**.201**	**.331**	**.308**	**.186**	.159	**–.566**	**–.193**	–.125	**–.667**	**–.262**	–.114
				(.046)	(.085)	(.075)	(.077)	(.082)	(.092)	(.056)	(.094)	(.104)	(.052)	(.082)	(.090)
Rapport	4.42	0.79	.78	.127	**.272**	.097	**.265**	.067	–.048	**–.323**	**–.303**	**–.298**	**–.172**	**–.306**	**–.332**
				(.076)	(.074)	(.073)	(.066)	(.076)	(.078)	(.074)	(.085)	(.078)	(.069)	(.068)	(.068)

Note. Coefficients are latent correlations. Standard errors are in parentheses. $p < .05$. and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S17

Perceptions of Instruction as Predictors of Achievement Emotions: Latent Multiple Regression Analysis (Study 3, Time 2–3)

Predictor	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
	Enjoyment		*Hope*		*Pride*		*Relaxation*		*Assurance*		*Relief*	
Stimulation	**.487**	.079	.075	.089	**.217**	.083	**.228**	.073	.045	.083	**.218**	.098
Clarity	.066	.162	.343	.197	.148	.185	.274	.181	.014	.183	–.115	.167
Difficulty	**–.326**	.089	**–.361**	.109	–.148	.110	**–.503**	.088	**–.581**	.101	.144	.113
Discussion	**–.240**	.081	–.125	.089	–.092	.099	–.105	.091	–.185	.096	.119	.120
Enthusiasm	**.396**	.133	**–.253**	.177	.057	.164	.074	.146	.258	.158	.147	.159
Rapport	**–.125**	.104	.154	.097	–.002	.111	–.040	.105	–.044	.097	–.057	.115
Gender	**.122**	.063	–.040	.068	.098	.067	.068	.058	**.173**	.061	–.030	.068
Age	**.135**	.062	.091	.061	–.005	.078	.089	.064	**.177**	.061	**–.172**	.082
GPA	–.024	.042	–.077	.033	.007	.036	–.064	.034	**–.073**	.028	–.018	.043
R^2	**.498**	.055	**.281**	.071	**.106**	.048	**.410**	.065	**.370**	.073	**.142**	.057
	Anger		*Anxiety*		*Shame*		*Boredom*		*Hopelessness*		*Disappointment*	
Stimulation	**–.534**	.068	**–.162**	.069	.002	.076	**–.380**	.089	**–.202**	.077	.009	.079
Clarity	–.356	.188	**–.468**	.196	**–.513**	.216	–.104	.165	**–.461**	.195	**–.398**	.169
Difficulty	**.351**	.108	**.568**	.111	.197	.108	.052	.097	**.475**	.102	**.386**	.093
Discussion	**.275**	.084	**.311**	.085	.040	.098	**.203**	.088	**.240**	.077	.151	.097
Enthusiasm	.020	.169	.215	.154	**.368**	.163	**–.406**	.142	.246	.158	**.309**	.143
Rapport	–.041	.095	–.088	.091	–.168	.114	.084	.103	–.195	.110	**–.272**	.102
Gender	–.024	.056	.022	.071	–.048	.070	–.101	.060	.050	.065	–.048	.068
Age	**–.149**	.056	–.116	.070	–.018	.081	–.109	.056	–.097	.057	**–.149**	.054
GPA	.032	.048	–.024	.042	.003	.028	–.040	.027	–.017	.042	.002	.030
R^2	**.519**	.063	**.506**	.084	**.286**	.085	**.452**	.059	**.476**	.070	**.421**	.067

Note. Betas are standardized coefficients. Gender is coded 1= male, 2 = female. *SE* = standard error. $p < .05$, 01, and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S18

Fit of Structural Equation Models for Achievement Emotions and Health Problems (Study 3)

Model	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR
			Time 1–2				
Enjoyment	271.945	171	.000	.950	.940	.045	.045
Hope	143.546	108	.013	.974	.969	.033	.039
Pride	209.895	136	.000	.965	.956	.043	.044
Relaxation	181.921	121	.000	.963	.954	.041	.041
Assurance	176.322	108	.000	.957	.947	.046	.043
Relief	195.950	121	.000	.949	.937	.046	.047
Anger	262.368	171	.000	.955	.945	.043	.052
Anxiety	313.015	221	.000	.971	.962	.038	.043
Shame	163.399	135	.049	.986	.983	.027	.043
Boredom	256.658	167	.000	.966	.958	.043	.049
Hopelessness	234.572	178	.003	.978	.972	.033	.040
Disappointment	148.282	107	.005	.979	.974	.036	.040
Multiple emotion factors model	312.190	222	.000	959	945	036	044
			Time 2–3				
Enjoyment	261.891	171	.000	.959	.950	.045	.050
Hope	171.995	108	.000	.945	.933	.048	.047
Pride	255.097	136	.000	.936	.921	.058	.050
Relaxation	196.112	121	.000	.954	.943	.049	.044
Assurance	168.011	108	.000	.955	.945	.046	.044
Relief	216.783	121	.000	.921	.902	.055	.059
Anger	259.112	171	..000	.954	.945	.044	.045
Anxiety	332.760	221	.000	.962	.949	.044	.051
Shame	196.016	135	.001	.968	.960	.042	.049
Boredom	242.533	167	.000	.969	.961	.042	.043
Hopelessness	28.774	178	.000	.956	.943	.047	.051
Disappointment	161.795	107	.001	.967	.959	.044	.046
Multiple emotion factors model	317.151	222	.000	.956	.942	.037	.047

Note. CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

Table S19

Latent Correlations of Achievement Emotions with Health Problems (Study 3)

	M	*SD*	α	Enjoy-ment	Hope	Pride	Relax-ation	Assu-rance	Relief	Anger	Anx-iety	Shame	Bore-dom	Hope-less-ness	Disap-point-ment
Health Problems Time 1	2.36	1.10	.84	–.135	**–.187**	**–.294**	**–.286**	**–.351**	**.166**	.130	**.491**	**.435**	.122	**.346**	**.299**
				(.076)	(.074)	(.071)	(.068)	(.061)	(.077)	(.074)	(.066)	(.071)	(.069)	(.078)	(.063)
Health Problems Time 2	2.28	1.09	.85	**–.159**	**–.254**	**–.295**	**–.370**	**–.382**	.066	**.234**	**.511**	**.422**	**.160**	**.379**	**.333**
				(.070)	(.074)	(.069)	(.070)	(.062)	(.092)	(.069)	(.062)	(.075)	(.072)	(.074)	(.070)
Health Problems Time 3	2.34	1.12	.85	**–.248**	**–.221**	**–.218**	**–.315**	**–.272**	.097	**.250**	**.491**	**.436**	**.238**	**.445**	**.329**
				(.074)	(.078)	(.076)	(.072)	(.075)	(.086)	(.074)	(.069)	(.077)	(.075)	(.076)	(.071)

Note. Coefficients are latent correlations. Standard errors are in parentheses. $p < .05$. and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** coefficients: $p < .05$.

Table S20

Structural Equation Models for Achievement Emotions and Health Problems (Study 3, Time 2–3): Factor Loadings, Path Coefficients, and Residual Variances

	Enjoyment model		*Hope model*		*Pride model*		*Relaxation model*		*Assurance model*		*Relief model*	
Factor loadings												
Emotion	.50–.86		.72–.84		.52–.92		.81–.90		.83–.86		.53–.88	
Health problems	.51–.63		.51–.63		.51–.63		.51–.63		.51–.63		.51–.63	
Paths	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
Emo → Health prob.	**−.190**	.087	**−.237**	.078	**−.281**	.078	**−.288**	.078	**−.301**	.072	−.005	.086
Gender → Health prob.	.109	.069	.119	.072	.074	.072	.095	.070	.063	.072	.106	.073
Age → Health prob.	**−.185**	.074	**−.235**	.070	**−.227**	.068	**−.203**	.063	**−.196**	.067	**−.234**	.068
GPA → Health prob.	.032	.042	.044	.039	.027	.041	.027	.034	.042	.037	.029	.039
Gender → Emo	.036	.067	.047	.083	−.096	.066	−.017	.066	−.136	.077	**.230**	.083
Age → Emo	**.260**	.066	.027	.055	.044	.071	**.130**	.057	**.134**	.055	−.078	.095
GPA → Emo	.018	.051	.061	.098	−.011	.048	−.005	.059	.049	.066	.022	.094
Residual Variances	.896		.869		.849		.845		.841		.929	
	Anger model		*Anxiety model*		*Shame model*		*Boredom model*		*Hopelessness model*		*Disappointment model*	
Factor loadings												
Emotion	.33–.82		.58–.90		.73–.95		.72–.87		.75–.94		.80–.97	
Ach	.52–.63		.53–.63		.52–.63		.51–.63		.52–.63		.52–.63	
Paths												
Emo → Health prob.	**.224**	.083	**.395**	.080	**.271**	.089	**.173**	.081	**.289**	.089	**.235**	.083
Gender → Health prob.	.114	.068	.097	.070	.078	.074	.120	.068	.109	.073	.105	.070
Age → Health prob.	**−.179**	.067	**−.183**	.058	**−.198**	.067	**−.186**	.072	**−.198**	.066	**−.188**	.065
GPA → Health prob.	.028	.042	.046	.046	.033	.038	.017	.043	.034	.036	.036	.038
Gender → Emo	−.033	.068	.042	.070	.100	.062	−.086	.063	−.001	.071	.021	.070
Age → Emo	**−.220**	.060	**−.149**	.066	**−.139**	.037	**−.273**	.050	**−.131**	.038	**−.195**	.048
GPA → Emo	−.004	.058	−.054	.113	−.015	.049	.061	.082	−.018	.064	−.038	.102
Residual Variances	.884		.772		.856		.902		.845		.875	

Note. All coefficients are standardized coefficients. Gender is coded 1= male, 2 = female. GPA = final high school achievement. $p < .05$, 01, and .001 for ß > 1.96, 2.58, and 3.29 *SE*, respectively. **Bold** path coefficients: $p < .05$.

Table S21

Structural Equation Models for Affect Factors and Health Problems (Study 3): Factor Loadings, Path Coefficients, and Residual Variances

	Pos. affect		Relief		Anger–boredom		Low-control neg. affect		Health problems	
					Time 1–2					
Factor loadings	.40−.55		.80		.77−.86		.65−.82		.57−.67	
	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
Effects of emotion										
Positive emotion									.048	.103
Relief									−.150	.102
Anger-boredom									−.030	.095
Low-control neg. emotion									**.448**	.088
Effects of covariates										
Gender	.111	.104	.124	.091	−.013	.070	.064	.068	**.190**	.070
Age	.137	.083	**.233**	.076	**−.219**	.056	−.097	.057	**−.286**	.066
GPA	.052	.087	−.088	.046	−.073	.112	−.036	.074	.033	.029
Residual Variances	.967		.931		.951		.987		.682	
					Time 2−3					
Factor loadings	.35−.56		.79		.65−.85		.75−.91		.53−.63	
	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*	ß	*SE*
Effects of emotion										
Positive emotion									−.149	.128
Relief									−.014	.109
Anger-boredom									−.021	.101
Low-control neg. emotion									**.327**	.098
Effects of covariates										
Gender	−.048	.093	**.285**	.099	−.042	.082	.044	.086	.087	.077
Age	.145	.105	−.117	.104	**−.251**	.070	−.062	.025	**−.202**	.071
GPA	.033	.036	.009	.074	.022	.056	−.069	.077	.042	.029
Residual Variances	.977		.904		.934		.994		.783	

Note. Factor loadings, path coefficients, and residual variances are standardized coefficients. Gender is coded 1= male, 2 = female. $p < .05$, 01, and .001 for ß > 1.96, 2.58, and 3.29 *SE* , respectively. **Bold** path coefficients: $p < .05$.

Table S22

Descriptive Statistics for Emotion Variables (Study 4): Means, Standard Deviations, Skewness, and Kurtosis

Emotion	*M*	*SD*	Skewness	Kurtosis
Enjoyment	3.127	1.204	–0.248	–0.928
Pride	2.793	1.246	0.114	–1.053
Hope	2.515	1.346	0.393	–1.099
Relief	2.278	1.236	0.609	–0.714
Anger	1.691	1.016	1.505	1.564
Anxiety	2.439	1.282	0.609	–0.709
Guilt	1.639	1.038	1.682	1.999
Boredom	2.222	1.331	0.786	–0.620
Hopelessness	1.772	1.132	1.428	1.040
Disappointment	1.917	1.172	1.221	0.549

Table S23

Dynamic Structural Equation Models for Appraisals and Emotions (Study 4):

Random Effects (Variances)

	Autoregressive Effects		*Cross-lagged effects*	
	App t-1 → App t	Emo t-1 → Emo t	App t-1 → Emo t	Emot t-1 → App
		Perceived Control and Emotions		
Enjoyment	.131 [.081, .208]	.151 [.096, .215]	.238 [.144, .378]	.097 [.070, .142]
Hope	.128 [.077, .182]	.101 [.056, .151]	.144 [.075, .230]	.062 [.036, .099]
Pride	.098 [.059, .146]	.094 [.048, .150]	.097 [.036, .200]	.030 [.013, .054]
Relief	.103 [.065, .147]	.106 [.066, .152]	.167 [.073, .276]	.042 [.023, .072]
Anger	.145 [.093, .211]	.170 [.119, .231]	.270 [.165, .423]	.090 [.055, .137]
Anxiety	.116 [.073, .163]	.125 [.072, .185]	.211 [.122, .341]	.062 [.035, .102]
Guilt	.128 [.076, .182]	.143 [.100, .195]	.288 [.172, .436]	.064 [.024, .120]
Boredom	.137 [.090, .190]	.185 [.136, .246]	.191 [.108, .311]	.050 [.031, .077]
Hopelessness	.152 [.105, .208]	.171 [.120, .233]	.190 [.103, .297]	.089 [.051, .129]
Disappointment	.136 [.089, .198]	.165 [.110, .234]	.284 [.134, .448]	.068 [.041, .105]
		Perceived Value and Emotions		
Enjoyment	.158 [.109, .224]	.103 [.049, .162]	.174 [.113, .254]	.087].049, .139]
Hope	.159 [.113, .218]	.080 [.046, .131]	.106 [.058, .166]	.053 [.028, .085]
Pride	.136 [.094, .181]	.094 [.046, .156]	.104 [.053, .178]	.042 [.022, .066]
Relief	.165 [.125, .219]	.129 [.083, .180]	.112 [.061, .193]	.064 [.031, .098]
Anger	.134 [.095, .176]	.137 [.096, .186]	.106 [.060, .181]	.112 [.062, .180]
Anxiety	.145 [.105, .191]	.096 [.055, .149]	.097 [.048, .155]	.037 [.011, .093]
Guilt	.148 [.111, .198]	.127 [.090, .170]	.176 [.120, .248]	.104 [.058, .167]
Boredom	.143 [.097, .194]	.153 [.106, .208]	.125 [.068, .203]	.098 [.064, .149]
Hopelessness	.141 [.094, .202]	.132 [.083, .187]	.164 [.099, .257]	.058 [.021, .111]
Disappointment	.154 [.110, .210]	.153 [.098, .219]	.125 [.062, .213]	.078 [.040, .123]

Note. App = appraisal (control in the upper part, value in the lower part of the table). Emo = emotion. Autoregressive and cross-lagged effects are random effect (variances). 95% credible intervals in brackets.

5. Achievement Emotions Questionnaire – Revised (AEQ–R)

The items of this questionnaire pertain to 12 different achievement emotions. In the following, items are presented in a systematic order. In the questionnaire, items are presented in three blocks pertaining to emotional feelings experienced before, during, and after attending class, studying, and taking tests and exams (indicated by the last letter ["B", "D", or "A"] within items labels). Items are answered using a 5-point Likert scale, 1 = *strongly disagree* to 5 = *strongly agree*.

Instructions for the Three Blocks of the AEQ-R

"**A. Before starting to work.** Attending classes, studying, and taking tests and exams at university can induce different feelings. This part of the questionnaire refers to emotions you may experience **BEFORE** being in class, studying, or taking a test in this course. Prior to answering the questions on the following pages, please recall some typical situations of attending class, studying, or taking a test you have experienced in this course. Please read each item carefully and indicate how you typically feel before attending class, studying, or taking a test in this course."

"**B. During work.** The following questions pertain to feelings you may experience **DURING** class, studying, or taking a test. Please indicate how you typically feel during class, studying, or taking a test in this course."

"C. After work. The following questions pertain to feelings you may experience **AFTER** class, studying, or taking a test. Please indicate how you typically feel after class, studying, or taking a test in this course."

Modifying the Instrument for Use in Other Contexts

The AEQ-R can be used to assess emotions in achievement settings in various domains, such as education, work, and sports. The current instructions pertain to educational contexts. For use in other contexts, the instructions can be modified by depicting achievement settings in those contexts. A few items of the current instrument refer to emotions "in this course" to provide context. This term can be skipped or replaced by alternative terms when the scales are used to assess achievement emotions in other domains.

Scales and Items of the AEQ-R

1. Enjoyment

JOY1B	I get excited about doing my work.
JOY2B	I look forward to doing my assignments.
JOY3B	Before starting to work, I am eager to get going.
JOY4D	I enjoy doing my assignments.
JOY5D	Difficult tasks in this course are a challenge that I enjoy.
JOY6D	I enjoy the challenges in my work.
JOY7D	I enjoy working so much that I get invigorated.
JOY8D	When my work is going well, it gives me a rush.

2. Hope

HOP1B	I am full of hope that I will excel in this course.
HOP2B	I am hopeful that I will perform well in this course.
HOP3B	I have great hope that my abilities will be sufficient.
HOP4D	I sense a feeling of hope that I will be successful.

3. Pride

PRD1A	I am proud of myself.
PRD2A	I'm proud of my competence.
PRD3A	To think about my success makes me feel proud.
PRD4A	I'm proud of how well I mastered my assignments.
PRD5A	I'm proud of my accomplishments.
PRD6A	I am bursting with pride because I have done well.

4. Relaxation

RLX1D	I feel relaxed when doing my work.
RLX2D	I feel calm when working on my assignments.
RLX3D	During my work in this course I feel laid-back.
RLX4D	I feel relaxed when working on difficult tasks.
RLX5D	I feel at ease doing my work in this course.

5. Assurance

ASS1B	I feel relaxed because I know I will be successful.
ASS2B	The thought of succeeding makes me feel relaxed.
ASS3B	I feel relaxed because I know I will succeed even if it gets difficult.
ASS4B	I feel relaxed because I anticipate mastering the demands of this course.

6. Relief

RLF1A	I feel relieved when I learn I have not done poorly.
RLF2A	I feel relief because I succeeded on my assignments.
RLF3A	When I have been able to complete difficult work in this course, I feel freed.
RLF4A	When I succeed at a difficult task, the tension in my stomach goes away.
RLF5A	After successful task completion, I can finally breathe easily again.

7. Anger

ANG1B	I get angry when I have to do my work.
ANG2B	I get angry about the amount of work I need to do in this course.
ANG3D	Doing my work makes me irritated.
ANG4D	I get quite annoyed when doing my assignments.
ANG5D	When thinking about all my useless assignments in this course, I get aggravated.
ANG6D	Because I'm angry, I get restless at work in this course.
ANG7D	When working for an extended period of time, my irritation makes me restless.
ANG8D	I get so angry, I start feeling hot and flushed.

8. Anxiety

ANX1B	I get tense when I start to work.
ANX2B	Before difficult tasks in this course I feel nervous and uneasy.
ANX3B	I worry my assignments might be too difficult.
ANX4B	I worry I might fail at my assignments in this course.
ANX5B	When I think about my work, I feel queasy.
ANX6B	Before difficult tasks I feel sick to my stomach.
ANX7D	I get tense during my work.
ANX8D	I feel nervous during difficult tasks.
ANX9D	I worry I might not be able to complete all my work.
ANX10D	I worry I might fail.
ANX11D	I feel panicky when a task gets difficult in this course.
ANX12D	Worry about not completing my assignments makes me sweat.

9. Shame

SHM1A	My poor performance embarrasses me.
SHM2A	I feel ashamed because I am not as competent as others.
SHM3A	I feel ashamed that I can't absorb the simplest of details.
SHM4A	I feel ashamed because I realize that I lack ability.
SHM5A	Because I am ashamed my pulse races.
SHM6A	When others find out about my poor performance I start to blush.

10. Boredom

BOR1D	I get bored.
BOR2D	This course bores me to death.
BOR3D	Because I get bored, my mind begins to wander.
BOR4D	While working, it seems like this task will never be over.
BOR5D	My assignments are so boring that I find myself daydreaming.
BOR6D	I get so bored, I have problems staying alert.
BOR7D	I start yawning because I'm so bored.
BOR8D	The work in this course bores me so much that I feel exhausted.

11. Hopelessness

HPL1B	I feel hopeless.
HPL2B	Even before starting to work, I am resigned to the fact that I won't understand the material.
HPL3B	I have lost all hope in understanding my assignments.
HPL4B	My hopelessness steals of all my energy.
HPL5D	I have given up hope.
HPL6D	I start to think that no matter how hard I try I won't succeed.
HPL7D	I'm discouraged about the fact that I'll never master the material.
HPL8D	I'm resigned to the fact that I haven't got the ability.
HPL9D	I feel so hopeless that I have no energy left.

12. Disappointment

DIS1A	I am disappointed about my lack of accomplishments.
DIS2A	I feel disappointed that I did not succeed.
DIS3A	I am disappointed that I did not perform well.
DIS4A	I feel disappointed about my lack of ability.

6. Sample Mplus and MLwiN Syntax

6.1 Syntax for Confirmatory Factor Analysis of Emotion Scales (CFA): Example Enjoyment

```
TITLE:  Enjoyment CFA

DATA: FILE IS "Study1_emotions.dat";

VARIABLE: NAMES ARE
    ID joy1 joy2 joy3 joy4 joy5 joy6 joy7 joy8 hop1 hop2 hop3 hop4
    prd1 prd2 prd3 prd4 prd5 prd6 rlx1 rlx2 rlx3 rlx4 rlx5 rlf1 rlf2 rlf3 rlf4 rlf5
    ang1 ang2 ang3 ang4 ang5 ang6 ang7 ang8 anx1 anx2 anx3 anx4 anx5 anx6
    anx7 anx8 anx9 anx10 anx11 anx12 shm1 shm2 shm3 shm4 shm5 shm6
    bor1 bor2 bor3 bor4 bor5 bor6 bor7 bor8 hpl1 hpl2 hpl3 hpl4 hpl5 hpl6 hpl7
    hpl8 hlp9 dis1 dis2 dis3 dis4;

USEVARIABLES ARE joy1-joy8;

MISSING ARE ALL (99);

ANALYSIS: Estimator = MLR;

MODEL:
    joy by joy1-joy8;
   !Correlations between residuals
    joy1-joy3 with joy1-joy3;
    joy4-joy6 with joy4-joy6;
    joy7 with joy8;

OUTPUT: SAMPSTAT STDYX FSDETERMINACY MODINDICES;

SAVEDATA:
   FILE IS fscores_joy.dat;
   SAVE IS fscores;
   FORMAT IS free;
```

6.2 Syntax for Exploratory Structural Equation Models of Emotion Scales (ESEM): Example Positive Emotions

```
TITLE:  Positive Emotions ESEM

DATA: FILE IS "Study1_emotions.dat";

VARIABLE: NAMES ARE
   ID joy1 joy2 joy3 joy4 joy5 joy6 joy7 joy8 hop1 hop2 hop3 hop4
   prd1 prd2 prd3 prd4 prd5 prd6 rlx1 rlx2 rlx3 rlx4 rlx5 rlf1 rlf2 rlf3 rlf4 rlf5
   ang1 ang2 ang3 ang4 ang5 ang6 ang7 ang8 anx1 anx2 anx3 anx4 anx5 anx6
   anx7 anx8 anx9 anx10 anx11 anx12 shm1 shm2 shm3 shm4 shm5 shm6
   bor1 bor2 bor3 bor4 bor5 bor6 bor7 bor8 hpl1 hpl2 hpl3 hpl4 hpl5 hpl6 hpl7
   hpl8 hlp9 dis1 dis2 dis3 dis4;

USEVARIABLES ARE
   joy1-joy8 hop1-hop4 prd1-prd6 rlx1-rlx5 rlf1-rlf5;

MISSING ARE ALL (99);

ANALYSIS:
   ROTATION = target (oblique);
   ESTIMATOR = MLR;

MODEL:
   joy by joy1-rlf5 hop1-rlf5~0;
   hope by joy1-rlf5 joy1-joy8~0 prd1-rlf5~0;
   pride by joy1-rlf5 joy1-hop4~0 rlx1-lrf5~0;
   relax by joy1-rlf5 joy1-prd6~0 rlf1-rlf5~0;
   relief by joy1-rlf5 joy1-rlx5~0;

   !Correlations between residuals
   joy1-joy3 with joy1-joy3;
   joy4-joy6 with joy4-joy6;
   joy7 with joy8;
   prd1 with prd2;
   prd3 with prd4;
   prd4 with prd5 prd6;
   prd5 with prd6;
   rlx1 with rlx2 rlx4 rlx5;
   rlx2 with rlx4;
   rlf1 with rlf2;
   rlf2 with rlf3;
   rlf4 with rlf5;

OUTPUT:  SAMPSTAT STDYX MODINDICES;
```

6.3 Syntax for Facet Analysis (MLwiN)

(1) $Emo_{ij} = \beta_{0j}constant + \beta_{1j}valence + \beta_{2j}arousal + \beta_{3j}object1 + \beta_{4j}object2 + \beta_{5j}valence.arousal + \beta_{6j}valence.object1 + \beta_{7j}valence.object2 + \beta_{8j}arousal.object1 + \beta_{9j}arousal.object2 + \beta_{10j}object1.object2 + \beta_{11j}valence.arousal.object1 + \beta_{12j}valence.arousal.object2$

(2) $\beta_{0j} = \gamma_{00} + u_{0j} + e_{0ij}$
(3) $\beta_{1j} = \gamma_{10} + u_{1j}$
(4) $\beta_{2j} = \gamma_{20} + u_{2j}$
(5) $\beta_{3j} = \gamma_{30} + u_{3j}$
(6) $\beta_{4j} = \gamma_{40} + u_{4j}$
(7) $\beta_{5j} = \gamma_{50} + u_{5j}$
(8) $\beta_{6j} = \gamma_{60} + u_{6j}$
(9) $\beta_{7j} = \gamma_{70} + u_{7j}$
(10) $\beta_{8j} = \gamma_{80} + u_{8j}$
(11) $\beta_{9j} = \gamma_{90} + u_{9j}$
(12) $\beta_{10j} = \gamma_{100} + u_{10j}$
(13) $\beta_{11j} = \gamma_{110} + u_{11j}$
(14) $\beta_{12j} = \gamma_{120} + u_{12j}$

whereby

Emo_{ij} = emotion i (e.g., joy, hope; Level 1) for person j (Level 2)
β_{kj} = effect of contrast variable or interaction for person j (k = 1,…,12)
γ_{k0} = fixed effect (average effect across persons; k = 0,…,12)
u_{kj} = random effect (deviation of effect in person j from average effect; k = 0,…,12)
e_{0ij} = residual

Contrast variables: valence (positive = +1, negative = −1); arousal (activating = +1, deactivating = −1); object1 = object focus contrast 1 (activity emotions = +1, outcome emotions = −1); object2 = object focus contrast 2 (prospective outcome emotions = +1, retrospective outcome emotions = −1, activity emotions = 0)
2-way interactions: valence.arousal, valence.object1, valence.object2, arousal.object1, arousal.object2
3-way interactions: valence.arousal.object1, valence.arousal.object2

At Level 1, MLwiN models the within-person effects as defined in equation (1). At Level 2, MLwiN models the random variances of the within-person effects u_{kj} as reported in Table 2 (main text).

6.3 Syntax for Structural Equation Models of Emotion and Achievement: Example Enjoyment and Course Performance

```
TITLE:  Enjoyment and Course Performance

DATA: FILE IS "Study2_emotions_performance.dat";

VARIABLE: NAMES ARE
    ID joy1 joy2 joy3 joy4 joy5 joy6 joy7 joy8 hop1 hop2 hop3 hop4
    prd1 prd2 prd3 prd4 prd5 prd6 rlx1 rlx2 rlx3 rlx4 rlx5 assu1 assu2 assu3 assu4
    rlf1 rlf2 rlf3 rlf4 rlf5 ang1 ang2 ang3 ang4 ang5 ang6 ang7 ang8
    anx1 anx2 anx3 anx4 anx5 anx6 anx7 anx8 anx9 anx10 anx11 anx12
    shm1 shm2 shm3 shm4 shm5 shm6 bor1 bor2 bor3 bor4 bor5 bor6 bor7 bor8
    hpl1 hpl2 hpl3 hpl4 hpl5 hpl6 hpl7 hpl8 hlp9 dis1 dis2 dis3 dis4
    gender age satv satm satw exam1 exam2 exam3;

USEVARIABLES ARE
    joy1-joy8 gender age satv satm satw exam1 exam2 exam3;

MISSING ARE ALL (999);

ANALYSIS:
    ESTIMATOR = MLR;

MODEL:
    joy by joy1-joy8;
    sat by satv satm satw;
    exam by exam1 exam2 exam3;

    joy1-joy3 with joy1-joy3;
    joy4-joy6 with joy4-joy6;
    joy7 with joy8;
    exam1 with exam2;
    exam2 with exam3;

    exam on joy gender age sat;
    joy on gender age sat;

OUTPUT:  SAMPSTAT STDYX MODINDICES TECH4;
!Technical Output 4 provides estimates for latent correlations between the variables
```

6.4 Syntax for Dynamic Structural Equation Modeling (DSEM): Example Perceived Control and Enjoyment

```
TITLE:  Perceived Control and Enjoyment DSEM

DATA: FILE IS "Weekly_emotions.dat";

VARIABLE: NAMES ARE
   ID Time Cont1 Cont2 Cont3 Cont4 Cont5 Joy Hope Pride Anger Anx Guilt Bore Hless;

MISSING ARE ALL (-99);

USEVARIABLES ARE
   time joy con;

CLUSTER IS ID;

LAGGED = con(1) joy(1);

DEFINE:
   con = mean (cont1 cont2 cont3 cont4 cont5);

ANALYSIS:
   TYPE = twolevel random;
   ESTIMATOR = Bayes; !DSEM requires Bayes estimation
   PROCESSORS = 4;

MODEL:

   %WITHIN%
   con_lag | con ON con&1; !Autoregressive path control
   joy_lag | joy ON joy&1; !Autoregressive path joy
   joy_con | joy ON con&1; !cross-lagged path control → joy
   con_joy | con ON joy&1; ! cross-lagged path joy → control
   con_time | con ON time; !effect of time on control
   joy_time | joy ON time; !effect of time on joy

   %BETWEEN%
   !Correlations between random effects
   Con WITH joy Con_Lag Con_joy joy_Con joy_lag;
   joy wWITH Con_Lag Con_joy joy_Con joy_lag;
   Con_Lag WITH Con_joy joy_Con joy_lag;
   Con_joy WITH joy_Con joy_lag;
   joy_Con WITH joy_lag;

OUTPUT: STDYX TECH1 TECH8;
PLOT: TYPE = PLOT3; FACTOR = ALL;
```