CORRECTION

Correction to: Resilience to health challenges is related to different ways of thinking: mediators of physical and emotional quality of life in a heterogeneous rare-disease cohort

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It has come to our attention that, due to a statistical programming error, the Resilience score was incorrectly calculated. The score used in the analyses reported in our article "Resilience to health challenges is related to different ways of thinking: Mediators of quality of life in a heterogeneous rare-disease cohort" [1] reflected the predicted values for CDC Health Days Activities of Daily Living (ADL), not the saved residuals multiplied by negative 1, as we had thought and thus reported in the abovementioned article. This error could affect the interpretation of the findings presented in the article that was published. Accordingly, we have re-analyzed the data after correcting this error. Resilience operationalized in the corrected analysis manner reflects the intended score: greater- or less-than-expected ADL days in the past month given physical and mental health problem days.

Results are summarized in Tables 2, 3, and 4 below, and in the pie charts below (Figs. 1 and 2). Tables 2 and 3 highlight the small differences in the regression models from those originally published. Specifically, while physical-functioning models with resilience explain less variance than in the original publication, the p values were unchanged. For mental-health functioning, corrected models with resilience explain less variance than in the original publication and the p values for resilience become less statistically significant in models with appraisal ($p = 0.031$) and non-significant in models with appraisal and catalysts ($p = 0.139$). Resilience measured in this manner contributes little unique variance to the explanation of physical- or mental- health functioning (1.1% and 0%). The small total effect of resilience is largely subsumed by appraisal (0.7% and 0.4%). The explanatory power of appraisal alone, however, is not affected by this error, and remains substantial (13.7% and 27.4% for physical and mental health, respectively).

The conclusions of the paper are similar. Appraisal processes differ somewhat for physical and emotional outcomes, and resilient people employ different processes than non-resilient people. Namely, high resilience was associated with a focus on maintaining a calm and healthy lifestyle, self-acceptance, and remaining positive. In contrast, low resilience was associated with a focus on health problems, concern about what their doctors are telling them, and frequent social comparison to others who were better off. In these corrected analyses, resilience was a significant predictor of physical but not emotional functioning in the full model ($p < 0.0001$ and $p = 0.139$). All effects involving resilience were much smaller in these corrected analyses, even if significant.

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Table 2 Hierarchical series of regression models predicting physical functioning to test mediation hypothesis

Model		Zero-order correlation	Standardized coefficients Beta	t	Sig	Corrected R2	Originally published R2	Originally published p value for resilience
1 Catalysts alone	No. treatments	− 0.42	− 0.27	− 14.05	< 0.001	0.274		
	Cancer comorbidity	0.22	0.22	14.63	< 0.001			
	Pain comorbidity	− 0.37	− 0.22	− 12.72	< 0.001			
	Aging comorbidities	− 0.26	− 0.07	− 3.93	< 0.001			
	Emotional comorbidity	− 0.25	− 0.05	− 3.12	0.002			
2 Resilience* alone	Resilience	0.18	0.18	10.28	< 0.001	0.034	0.363	Same
3 Appraisal alone	Health focus	− 0.38	− 0.38	− 25.22	< 0.001	0.274		
	Balanced lifestyle	0.29	0.29	19.36	< 0.001			
	Relationship focus	0.11	0.11	7.46	< 0.001			
	Pursue dreams	0.09	0.10	6.37	< 0.001			
	Maintain roles	0.09	0.09	5.75	< 0.001			
	Recent challenges	− 0.09	− 0.07	− 4.76	< 0.001			
	Lightness of being	0.06	0.07	4.61	< 0.001			
	Anticipating decline	− 0.06	− 0.06	− 4.00	< 0.001			
	Independence	0.06	0.06	3.80	< 0.001			
4 Catalysts + resilience	No. treatments	− 0.42	− 0.18	− 10.93	< 0.001	0.292	0.457	Same
	Cancer comorbidity	0.22	0.15	11.13	< 0.001			
	Pain comorbidity	− 0.37	− 0.16	− 11.11	< 0.001			
	Aging comorbidities	− 0.26	− 0.04	− 2.95	0.003			
	Emotional comorbidity	− 0.25	0.07	4.59	< 0.001			
	Resilience	0.18	0.14	9.14	< 0.001			
5 Catalysts + appraisal	Metabolic comorbidity	− 0.17	0.01	0.72	0.47	0.418		
	No. treatments	− 0.42	− 0.20	− 10.55	< 0.001			
	Cancer comorbidity	0.22	0.19	13.98	< 0.001			
	Pain comorbidity	− 0.37	− 0.19	− 12.27	< 0.001			
	Aging comorbidities	− 0.26	− 0.05	− 2.95	0.003			
	Emotional comorbidity	− 0.25	0.02	1.28	0.20			
	Health focus	− 0.38	− 0.30	− 21.82	< 0.001			
	Balanced lifestyle	0.29	0.20	7.26	< 0.001			
	Relationship focus	0.11	0.10	7.08	< 0.001			
	Independence	0.06	0.03	1.36	0.17			
	Maintain roles	0.09	0.08	4.95	< 0.001			
	Pursue dreams	0.09	0.06	4.32	< 0.001			
	Anticipating decline	− 0.06	− 0.04	− 3.08	0.002			
	Lightness of being	0.06	0.04	3.00	0.003			

Table 2 (continued)

Model		Zero-order correlation	Standard-ized coef-ficients Beta	t	Sig	Corrected R2	Originally published R2	Originally published p value for resilience
	No. treatments × balanced lifestyle	0.23	− 0.11	− 4.36	< 0.001			
	Cancer comorbidity × balanced lifestyle	0.26	0.08	3.65	< 0.001			
	Cancer comorbidity × recent challenges	− 0.10	− 0.05	− 3.47	0.001			
	Metabolic comorbidity × recent challenges	− 0.02	0.04	2.57	0.01			
	Metabolic comorbidity × nuturance	0.02	0.03	2.29	0.02			
	Metabolic comorbidity × balanced Lifestyle	0.17	0.04	2.24	0.03			
	Metabolic comorbidity × baintain roles	0.03	− 0.03	− 2.14	0.03			
	Metabolic comorbidity × reduce responsi-bilities	0.03	0.05	2.96	0.003			
	Emotional comorbidity × reduce responsi-bilities	0.01	− 0.03	− 2.23	0.03			
	No. treatments × inde-pendence	0.06	0.04	1.98	0.05			
6 Resil-ience + appraisal	Resilience	0.18	0.12	7.76	< 0.001	0.288	0.428	Same
	Health focus	− 0.38	− 0.22	− 15.53	< 0.001			
	Pursue dreams	0.09	0.09	6.91	< 0.001			
	Balanced lifestyle	0.29	0.09	6.20	< 0.001			
	Relationship focus	0.11	0.08	5.85	< 0.001			
	Independence	0.06	0.05	3.93	< 0.001			
	Maintain roles	0.09	0.05	3.39	< 0.001			
	Lightness of being	0.06	0.04	2.88	< 0.001			
	Anticipating decline	− 0.06	− 0.03	− 2.21	< 0.001			
	Recent challenges	− 0.09	0.03	2.04	< 0.001			
7 Catalysts + resil-ience + appraisal	Metabolic comorbidity	− 0.17	− 0.003	− 0.25	0.81	0.429	0.513	Same
	No. treatments	− 0.42	− 0.15	− 8.53	< 0.001			
	Cancer comorbidity	0.22	0.15	12.20	< 0.001			
	Pain comorbidity	− 0.37	− 0.16	− 11.24	< 0.001			
	Aging comorbidities	− 0.26	− 0.04	− 2.63	0.01			
	Emotional comorbidity	− 0.25	0.06	4.25	< 0.001			

Table 2 (continued)

Model		Zero-order correlation	Standardized coefficients Beta	t	Sig	Corrected R2	Originally published R2	Originally published p value for resilience
	Resilience	0.18	0.12	6.94	< 0.001			
	No. treatments_resil	0.50	− 0.06	− 2.67	0.01			
	Health focus	− 0.38	− 0.19	− 14.43	< 0.001			
	Relationship focus	0.11	0.07	5.64	< 0.001			
	Pursue dreams	0.09	0.06	4.75	< 0.001			
	Balanced lifestyle	0.29	0.05	1.97	0.05			
	Independence	0.06	0.06	4.84	< 0.001			
	Recent challenges	− 0.09	0.06	2.98	0.003			
	Maintain roles	0.09	0.04	2.88	0.004			
	Anticipating decline	− 0.06	− 0.06	− 2.94	0.003			
	Cancer comorbidity × balanced lifestyle	0.26	0.08	4.42	< 0.001			
	Pain comorbidity × balanced lifestyle	0.21	− 0.06	− 3.03	0.002			
	cancer comorbidity × recent challenges	− 0.10	− 0.05	− 2.73	0.01			
	Metabolic comorbidity × recent challenges	− 0.02	0.03	2.32	0.02			
	Aging comorbidities × lightness of being	0.05	0.02	1.92	0.05			
	No. treatments × anticipating decline	− 0.06	0.07	2.86	0.004			
	Aging comorbidities × anticipating decline	− 0.06	− 0.04	− 2.41	0.02			

*High resilience score reflects fewer lost days than expected

Table 3 Hierarchical series of regression models predicting emotional functioning to test mediation hypothesis

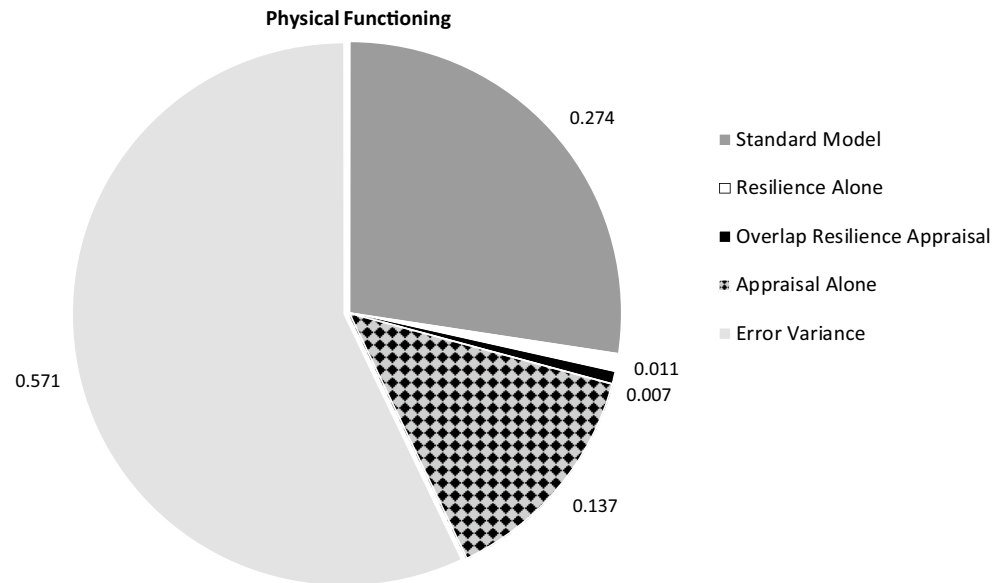|	Model		Zero-order correlation	Standardized coefficients Beta	t	Sig	R2	Originally published R2	Originally published p value for resilience
1	Catalysts alone	Emotional comorbidity	− 0.44	− 0.46	− 27.66	<0.001	0.202		
		Metabolic comorbidity	0.02	0.06	3.83	<0.001			
		Cancer comorbidity	0.08	0.06	3.62	<0.001			
		Pain comorbidity	− 0.09	0.04	2.68	0.007			
2	Resilience* alone	Resilience	0.10	0.09	5.48	<0.001	0.009	0.157	Same
3	Appraisal alone	Balanced lifestyle	0.51	0.51	38.31	<0.001	0.428		
		Recent challenges	− 0.37	− 0.37	− 27.59	<0.001			
		Reduce Responsibilities	− 0.09	− 0.10	− 7.27	<0.001			
		Anticipating decline	− 0.09	− 0.09	− 7.18	<0.001			
		Worry-free	− 0.08	− 0.07	− 5.52	<0.001			
		Nurturance	0.06	0.06	4.53	<0.001			
		Pursue dreams	− 0.07	− 0.06	− 4.41	<0.001			
		Health focus	− 0.05	− 0.03	− 2.34	0.019			
4	Catalysts + resilience	Emotional comorbidity	− 0.44	− 0.37	− 22.23	<0.001	0.205	0.271	Same
		Metabolic comorbidity	0.02	0.07	4.86	<0.001			
		Cancer comorbidity	0.08	0.01	0.87	0.387			
		Pain comorbidity	− 0.09	0.10	5.92	<0.001			
		Resilience	0.10	0.06	3.51	<0.001			
5	Catalysts + appraisal	Emotional comorbidity	− 0.44	− 0.24	− 16.71	<0.001	0.480		
		Metabolic comorbidity	0.02	0.04	3.34	0.001			
		Cancer comorbidity	0.08	− 0.02	− 1.93	0.05			
		Pain comorbidity	− 0.09	0.09	6.76	<0.001			
		Balanced lifestyle	0.51	0.45	33.24	<0.001			
		Recent challenges	− 0.37	− 0.36	− 17.25	<0.001			
		Reduce responsibilities	− 0.09	− 0.09	− 6.96	<0.001			
		Anticipating decline	− 0.09	− 0.08	− 6.22	<0.001			
		Worry free	− 0.08	− 0.03	− 1.44	0.15			
		Nurturance	0.06	0.07	5.04	<0.001			
		Pursue dreams	− 0.07	− 0.04	− 3.42	0.001			
		Metabolic comorbidity × nuturance	− 0.01	− 0.04	− 2.82	0.005			
		No. treatments × worry-free	− 0.09	− 0.05	− 2.57	0.01			
		Pain comorbidity × recent challenges	− 0.27	0.06	2.76	0.01			
		Aging comorbidity x health focus	− 0.08	− 0.04	− 2.75	0.01			
		Aging comorbidity × relationship focus	0.02	0.04	2.74	0.01			
		Metabolic comorbidity × relationship focus	− 0.03	− 0.03	− 2.18	0.03			

Table 3 (continued)

	Model		Zero-order correlation	Standardized coefficients Beta	t	Sig	R2	Originally published R2	Originally published p value for resilience
6	Resilience + appraisal	Resilience	0.10	0.03	2.16	0.031	0.429	0.440	< 0.001
		Balanced lifestyle	0.51	0.46	31.49	< 0.001			
		Recent challenges	− 0.37	− 0.34	− 25.10	< 0.001			
		Reduce responsibilities	− 0.09	− 0.10	− 7.55	< 0.001			
		Anticipating decline	− 0.09	− 0.09	− 6.60	< 0.001			
		Worry-free	− 0.08	− 0.07	− 5.41	< 0.001			
		Pursue dreams	− 0.07	− 0.06	− 4.52	< 0.001			
		Nurturance	0.06	0.06	4.26	< 0.001			
7	Catalysts + resilience + appraisal	Respiratory comorbidity	− 0.01	0.03	2.58	0.01	0.479	0.489	0.001
		Emotional comorbidity	− 0.44	− 0.22	− 15.18	< 0.001			
		Metabolic comorbidity	0.02	0.04	3.39	< 0.001			
		Cancer comorbidity	0.08	− 0.03	− 2.25	0.025			
		Pain comorbidity	− 0.09	0.10	7.03	< 0.001			
		Resilience	0.10	0.02	1.48	0.139			
		Balanced lifestyle	0.51	0.41	29.02	< 0.001			
		Recent challenges	− 0.37	− 0.36	− 17.15	< 0.001			
		Reduce responsibilities	− 0.09	− 0.09	− 7.44	< 0.001			
		Anticipating decline	− 0.09	− 0.08	− 6.05	< 0.001			
		Worry-free	− 0.08	− 0.03	− 1.31	0.190			
		Nurturance	0.06	0.08	5.24	< 0.001			
		Pursue dreams	− 0.07	− 0.04	− 3.51	0.001			
		Metabolic comorbidity × nurturance	− 0.01	− 0.05	− 3.29	0.001			
		Emotional comorbidity × recent challenges	− 0.26	0.05	2.48	0.010			
		No. treatments × worry-free	− 0.09	− 0.05	− 2.51	0.010			
		Respiratory comorbidity × resilience	0.21	0.03	2.17	0.030			
		Emotional comorbidity × resilience	0.35	0.03	1.45	0.148			
		Respiratory comorbidity × recent challenges	− 0.16	0.04	2.59	0.01			

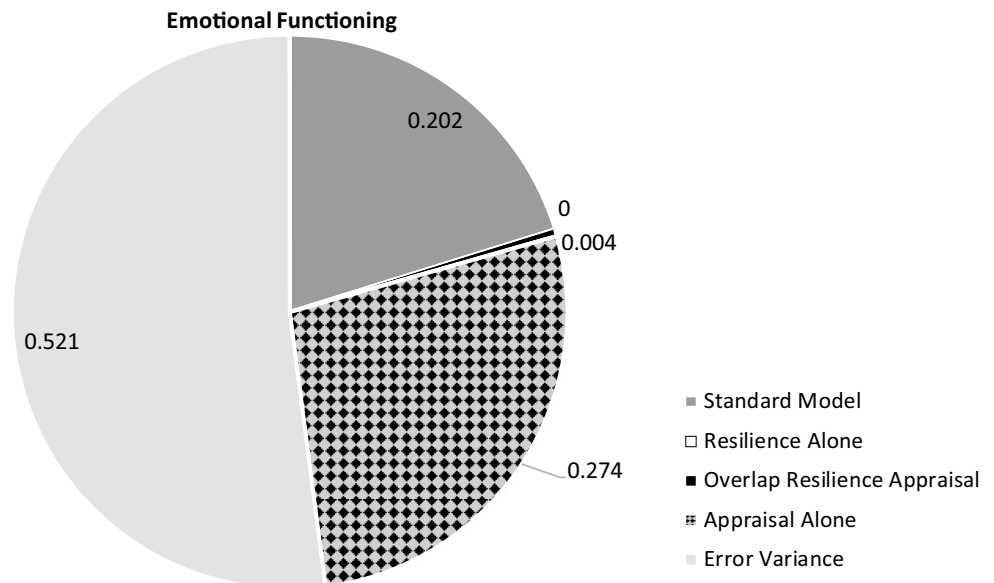*High resilience score reflects fewer lost days than expected

Table 4 Summary of explained variance in hierarchical regression model series testing mediation hypothesis

Model	Summary of hierarchical models							Appraisal mediated by resilience		
	1	2	3	4	5	6	7	3	6–2	(3 – (6–2))/3
	Catalysts alone	Resilience alone	Appraisal alone	Catalysts + resilience	Catalysts + appraisal	Resilience + appraisal	Catalysts + resilience + appraisal	Appraisal alone	Appraisal adds over resilience	% of variance in QOL due to appraisal mediated by resilience (%)
Physical functioning	0.27	0.03	0.27	0.29	0.42	0.29	0.43	0.27	0.25	7
Emotional functioning	0.20	0.01	0.43	0.21	0.48	0.43	0.48	0.43	0.42	2

Mediation adjusted for catalysts

	5–1	7–4	(5–1)-(7–4)/(5–1)
	Appraisal adds over catalysts alone	Appraisal adds over catalysts + resilience	% of variance in residualized QOL due to appraisal mediated by resilience (%)
Physical functioning	0.14	0.14	5
Emotional functioning	0.28	0.27	1

Fig. 1 Decomposition of Explained Variance in Physical Functioning. Proportion of variance in physical health-related QOL explained by appraisal and resilience, after controlling comorbidities and treatment (standard model). *Overlap* indicates variance explained by both resilience and appraisal, suggesting relatively weak mediation. Specifically, 0.007/(0.007+0.137) = 4.9% of the association of appraisal with physical health is also explained by resilience

Physical Functioning

0.274
0.011
0.007
0.137
0.571

- Standard Model
- Resilience Alone
- Overlap Resilience Appraisal
- Appraisal Alone
- Error Variance

Fig. 2 Decomposition of Explained Variance in Emotional Functioning. Proportion of variance in mental health-related QOL explained by appraisal and resilience, after controlling for comorbidities and treatment (standard model). *Overlap* indicates variance explained by both resilience and appraisal, suggesting almost no role for resilience. Specifically, 0.004/(0.004+0.274) = 1.43% of the association of appraisal with mental health is also explained by resilience

Emotional Functioning

0.202
0
0.004
0.274
0.521

- Standard Model
- Resilience Alone
- Overlap Resilience Appraisal
- Appraisal Alone
- Error Variance

Reference

1. Schwartz, C. E., Michael, W., & Rapkin, B. D. (2017). Resilience to health challenges is related to different ways of thinking: Mediators of quality of life in a heterogeneous rare-disease cohort. *Quality of Life Research, 26*, 3075–3088. https://doi.org/10.1007/s11136-017-1633-2