

**Table S1** Sensitivity analysis 1 of the multivariable models

Model	$\beta$	SE	b	P	Effect size
<b>Model 1</b>					
Study problems → loneliness (path a)	1.14	0.16	0.35	<0.001	
Loneliness → total difficulties score (path b)	2.39	0.10	0.53	<0.001	
Study problems → total difficulties score (path c)	3.35	0.65	0.23	<0.001	
Indirect effect via loneliness (a x b)	2.72	0.32	—	<0.001	
Total effect of study problems on total difficulties score (a x b + c)	6.07	0.88	—	<0.001	0.45
Loneliness → prosocial score (path b')	-0.57	0.03	-0.34	<0.001	
Study problems → prosocial score (path c')	-0.12	0.19	-0.02	0.544	
Indirect effect via loneliness (a x b')	-0.65	0.08	—	<0.001	
Total effect of study problems on prosocial score (a x b + c')	-0.77	0.22	—	0.002	0.84
Study problems ~					
Dislike of remote learning	0.39	0.02	0.30	<0.001	
<b>Model 2</b>					
Parent-child relationship → loneliness (path a)	5.34	0.85	0.28	<0.001	
Loneliness → total difficulties score (path b)	2.58	0.06	0.57	<0.001	
Parent-child relationship → total difficulties score (path c)	7.16	2.34	0.08	0.006	
Indirect effect via loneliness (a x b)	13.78	2.09	—	<0.001	
Total effect of parent-child relationship on total difficulties score (a x b + c)	20.93	3.58	—	<0.001	0.66
Loneliness → prosocial score (path b')	-0.57	0.02	-0.34	<0.001	
Parent-child relationship → prosocial score (path c')	-1.20	1.16	-0.04	0.311	
Indirect effect via loneliness (a x b')	-3.04	0.46	—	<0.001	
Total effect of parent-child relationship on prosocial score (a x b + c')	-4.24	1.32	—	0.004	0.72
Parent-child relationship ~					
Relationship with father	1.40	0.16	0.55	<0.001	
<b>Model 3</b>					
Family/friends with COVID-19 → loneliness (path a)	0.82	0.26	0.07	0.004	
Loneliness → total difficulties score (path b)	2.67	0.06	0.59	<0.001	
Family/friends with COVID-19 → total difficulties score (path c)	3.01	0.69	0.06	<0.001	
Indirect effect via loneliness (a x b)	2.20	0.70	—	0.005	
Total effect of family/friends with COVID-19 on total difficulties score (a x b + c)	5.21	1.36	—	0.001	0.42
Loneliness → prosocial score (path b')	-0.58	0.18	-0.35	<0.001	
Family/friends with COVID-19 → prosocial score (path c')	-1.17	0.34	-0.06	0.002	
Indirect effect via loneliness (a x b')	-0.48	0.15	—	0.005	
Total effect of family/friends with COVID-19 on prosocial score (a x b + c')	-1.65	0.44	—	0.001	0.29

$\beta$  = unstandardized estimate; b = standardized estimate. Effect size is the proportion explained, which is calculated by dividing the indirect effect by the total effect.

**Table S2** Sensitivity analysis 2 of the multivariable models

Model	$\beta$	SE	b	P	Effect size
<b>Model 1</b>					
Study problems → loneliness (path a)	0.09	0.02	0.15	<0.001	
Loneliness → total difficulties score (path b)	7.12	0.41	0.29	<0.001	
Study problems → total difficulties score (path c)	5.55	0.84	0.37	<0.001	
Indirect effect via loneliness (a x b)	0.64	0.11	—	<0.001	
Total effect of study problems on total difficulties score (a x b + c)	6.18	0.90	—	<0.001	0.10
Loneliness → prosocial score (path b')	-0.91	0.19	-0.10	<0.001	
Study problems → prosocial score (path c')	-0.71	0.23	-0.13	0.006	
Indirect effect via loneliness (a x b')	-0.08	0.02	—	0.002	
Total effect of study problems on prosocial score (a x b + c')	-0.79	0.23	—	0.002	0.10
Study problems ~					
Dislike of remote learning	0.39	0.02	0.31	<0.001	
<b>Model 2</b>					
Parent-child relationship → loneliness (path a)	0.77	0.19	0.24	0.001	
Loneliness → total difficulties score (path b)	7.20	0.31	0.29	<0.001	
Parent-child relationship → total difficulties score (path c)	14.52	3.34	0.18	<0.001	
Indirect effect via loneliness (a x b)	5.53	1.23	—	<0.001	
Total effect of parent-child relationship on total difficulties score (a x b + c)	20.05	3.97	—	<0.001	0.28
Loneliness → prosocial score (path b')	-0.81	0.25	-0.09	0.004	
Parent-child relationship → prosocial score (path c')	-3.43	1.32	-0.11	0.017	
Indirect effect via loneliness (a x b')	-0.62	0.21	—	0.009	
Total effect of parent-child relationship on prosocial score (a x b + c')	-4.05	1.28	—	0.004	0.15
Parent-child relationship ~					
Relationship with father	1.28	0.18	0.52	<0.001	
<b>Model 3</b>					
Family/friends with COVID-19 → loneliness (path a)	0.09	0.03	0.04	0.011	
Loneliness → total difficulties score (path b)	8.12	0.33	0.33	<0.001	
Family/friends with COVID-19 → total difficulties score (path c)	4.51	1.15	0.08	0.001	
Indirect effect via loneliness (a x b)	0.70	0.24	—	0.009	
Total effect of family/friends with COVID-19 on total difficulties score (a x b + c)	5.21	1.36	—	0.001	0.13
Loneliness → prosocial score (path b')	-1.02	0.17	-0.11	<0.001	
Family/friends with COVID-19 → prosocial score (path c')	-1.56	0.41	-0.08	0.001	
Indirect effect via loneliness (a x b')	-0.09	0.03	—	0.019	
Total effect of family/friends with COVID-19 on prosocial score (a x b + c')	-1.65	0.44	—	0.001	0.05

$\beta$  = unstandardized estimate; b = standardized estimate. Effect size is the proportion explained, which is calculated by dividing the indirect effect by the total effect.