



Supplementary Material

Article Title: A Risk Algorithm for the Persistence of Suicidal Thoughts and Behaviors During College

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Supplementary eTable 1. Multivariate individual-level associations between risk factors under study and adverse clinical patterns of STB during follow-up.

	<u>MULTIVARIATE</u>		<u>MULTIVARIATE</u>		<u>MULTIVARIATE</u>		<u>MULTIVARIATE</u>		<u>MULTIVARIATE</u>	
	<u>MODEL 1^a</u>		<u>MODEL 2^a</u>		<u>MODEL 3^a</u>		<u>MODEL 4^a</u>		<u>MODEL 5^a</u>	
	<u>One-time</u>	<u>Two-time</u>	<u>One-time</u>	<u>Two-time</u>	<u>One-time</u>	<u>Two-time</u>	<u>One-time</u>	<u>Two-time</u>	<u>One-time</u>	<u>Two-time</u>
	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>	<u>STB^b</u>
	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>	<u>OR (95%CI)</u>
<u>I. Socio-demographic variables</u>										
Being male	1.6 (0.9-3.0)	1.3 (0.7-2.6)	1.7 (0.9-3.3)	1.7 (0.8-3.3)	1.7 (0.8-3.6)	1.5 (0.7-3.3)	1.7 (0.8-3.9)	1.9 (0.7-4.9)	1.7 (0.7-3.9)	2.0 (0.7-6.0)
Age > 18 years	1.4 (0.7-2.7)	2.6* (1.3-5.4)	1.5 (0.7-2.9)	2.5* (1.2-5.2)	1.5 (0.8-3.2)	2.4* (1.1-5.5)	1.5 (0.7-3.2)	2.3 (0.9-5.6)	1.5 (0.6-3.3)	2.3 (0.8-6.7)
Non-Belgian nationality	0.9 (0.3-2.7)	0.6 (0.2-2.2)	0.8 (0.3-2.3)	0.5 (0.1-2.0)	0.7 (0.2-2.4)	0.5 (0.1-2.1)	0.7 (0.2-2.5)	0.5 (0.1-2.8)	0.7 (0.2-2.8)	0.6 (0.1-4.9)
Parents' financial situation difficult	0.9 (0.4-1.8)	0.7 (0.3-1.7)	0.8 (0.4-1.7)	0.6 (0.3-1.6)	0.7 (0.3-1.7)	0.6 (0.2-1.8)	0.7 (0.3-1.8)	0.5 (0.2-1.8)	0.7 (0.3-1.8)	0.5 (0.1-1.8)
Parental education ^c										
- both parents high	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
- only one parent high	1.3 (0.6-2.5)	1.2 (0.6-2.5)	1.3 (0.6-2.6)	1.2 (0.5-2.5)	1.2 (0.6-2.5)	1.1 (0.5-2.6)	1.2 (0.5-2.5)	1.1 (0.4-2.8)	1.2 (0.5-2.7)	0.9 (0.3-2.6)
- none of parents high	1.7 (0.7-4.1)	2.0 (0.8-5.0)	1.7 (0.7-4.2)	2.0 (0.7-5.5)	1.5 (0.6-3.9)	2.0 (0.6-6.4)	1.6 (0.6-4.4)	2.2 (0.6-8.1)	1.8 (0.6-5.1)	3.1 (0.7-14.7)
Non-intact familial composition ^d	1.2 (0.6-2.3)	1.2 (0.6-2.5)	1.2 (0.6-2.4)	1.1 (0.5-2.4)	1.3 (0.6-2.7)	0.9 (0.4-2.2)	1.3 (0.6-3.0)	1.0 (0.4-2.6)	1.3 (0.6-3.0)	1.2 (0.4-3.7)
Non-heterosexual orientation	1.1 (0.4-2.7)	1.6 (0.6-4.3)	0.9 (0.3-2.3)	1.3 (0.4-3.8)	1.0 (0.4-2.7)	1.6 (0.5-4.9)	0.6 (0.2-2.0)	0.7 (0.2-3.2)	0.6 (0.2-2.0)	0.5 (0.1-3.1)
<u>College-related socio-demographics</u>										
University Group membership										
- Human Sciences	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
- Science & Technology	1.0 (0.5-2.0)	0.9 (0.4-1.8)	1.0 (0.5-2.0)	0.9 (0.4-1.8)	1.0 (0.5-2.1)	0.9 (0.4-2.0)	1.0 (0.4-2.1)	1.0 (0.4-2.4)	1.0 (0.5-2.3)	1.1 (0.4-2.9)
- Biomedical Sciences	1.3 (0.6-3.0)	1.3 (0.5-3.2)	1.3 (0.6-3.2)	1.3 (0.5-3.2)	1.3 (0.5-3.3)	1.2 (0.4-3.6)	1.2 (0.5-3.3)	1.2 (0.4-4.1)	1.4 (0.5-3.9)	1.6 (0.4-6.7)
Non-GSE pre-educational level	1.0 (0.3-3.1)	0.6 (0.1-2.6)	0.9 (0.3-3.1)	0.5 (0.1-2.8)	0.9 (0.3-3.2)	0.4 (0.1-2.7)	0.8 (0.2-3.2)	0.4 (0.0-3.2)	0.7 (0.2-3.0)	0.2 (0.0-2.6)
Living with parents	1.2 (0.6-2.2)	0.9 (0.4-1.9)	1.2 (0.6-2.2)	1.0 (0.4-2.2)	1.1 (0.6-2.1)	0.8 (0.3-2.0)	1.1 (0.6-2.4)	0.9 (0.3-2.5)	1.1 (0.5-2.4)	0.8 (0.2-2.8)
<u>II. Traumatic experiences (< age 17)</u>										
parental psychopathology			1.4 (0.7-2.7)	1.6 (0.7-3.5)	1.3 (0.6-2.8)	1.7 (0.7-3.9)	1.4 (0.6-3.0)	1.8 (0.7-4.7)	1.4 (0.6-3.2)	1.9 (0.7-5.6)
physical abuse			1.5 (0.5-4.4)	2.4 (0.8-7.4)	1.2 (0.4-3.9)	2.2 (0.7-7.4)	1.4 (0.4-5.1)	2.7 (0.7-10.8)	1.2 (0.3-4.8)	2.1 (0.5-9.7)
emotional abuse			0.8 (0.4-1.8)	0.9 (0.4-2.1)	0.7 (0.3-1.6)	0.7 (0.3-1.8)	0.6 (0.3-1.5)	0.6 (0.2-1.7)	0.6 (0.2-1.6)	0.6 (0.2-2.0)
sexual abuse			1.6 (0.2-12.3)	5.4 (1.0-30.5)	1.8 (0.2-15.0)	6.3 (0.9-44.2)	2.1 (0.2-19.7)	7.7 (0.9-66.7)	2.2 (0.2-23.1)	8.8 (0.8-96.9)
neglect			1.5 (0.6-4.1)	1.2 (0.4-3.7)	1.3 (0.4-3.7)	0.7 (0.2-2.5)	1.4 (0.4-4.3)	0.8 (0.2-3.4)	1.2 (0.4-4.1)	0.7 (0.1-3.3)
bully victimization			1.2 (0.7-2.3)	1.0 (0.5-2.0)	1.4 (0.7-2.7)	1.1 (0.5-2.3)	1.2 (0.6-2.5)	0.9 (0.4-2.1)	1.3 (0.6-2.7)	1.0 (0.4-2.5)
dating violence			0.9 (0.4-2.4)	0.8 (0.3-2.4)	0.8 (0.3-2.3)	0.6 (0.2-1.9)	0.7 (0.2-2.2)	0.4 (0.1-1.8)	0.6 (0.2-2.0)	0.3 (0.1-1.7)
<u>III. Twelve-month stressful experiences</u>										
life-threatening illness or injury of a friend or family member					0.9 (0.4-1.9)	0.6 (0.2-1.6)	0.8 (0.3-1.9)	0.6 (0.2-1.7)	0.7 (0.3-1.8)	0.5 (0.2-1.9)

death of a friend or family member	1.2 (0.5-2.8)	2.2 (0.8-6.1)	1.2 (0.5-3.0)	2.2 (0.7-6.6)	1.1 (0.4-2.8)	1.8 (0.5-6.2)
break-up with a romantic partner	0.9 (0.4-2.0)	1.0 (0.3-2.7)	0.9 (0.3-2.2)	0.9 (0.3-2.7)	0.9 (0.3-2.3)	0.9 (0.2-3.4)
romantic partner cheated	0.7 (0.2-3.0)	0.5 (0.1-2.6)	0.7 (0.1-3.3)	0.6 (0.1-3.3)	0.6 (0.1-3.2)	0.4 (0.0-3.0)
serious betrayal someone else than partner	1.8 (0.8-3.9)	1.9 (0.8-4.5)	1.4 (0.6-3.4)	1.6 (0.6-4.3)	1.4 (0.6-3.5)	1.7 (0.5-5.6)
serious ongoing arguments/break-up with friend or family	1.1 (0.5-2.4)	1.6 (0.7-3.6)	1.1 (0.5-2.6)	1.8 (0.7-4.6)	1.1 (0.5-2.6)	1.6 (0.5-4.8)
life-threatening accident	7.1	7.1 (0.2-294.6)	6.5	7.1 (0.1-417.8)	7.2	12.0 (0.1-1418)
seriously physically assaulted	3.7 (0.3-50.2)	4.7 (0.2-124.4)	3.3 (0.2-50.3)	4.0 (0.1-133.8)	3.7 (0.2-65.0)	4.3 (0.1-345.2)
sexually assaulted or raped	5.5 (0.6-50.6)	2.2 (0.2-28.6)	4.2 (0.4-46.3)	1.5 (0.1-24.6)	5.5 (0.4-72.2)	0.9 (0.0-36.5)
any serious legal problem	1.0 (0.2-6.2)	3.3 (0.5-23.0)	1.2 (0.2-8.0)	3.3 (0.4-30.6)	1.2 (0.2-9.4)	4.3 (0.3-62.3)

IV. Twelve-month mental disorders

risk for internalizing disorder	1.0 (0.5-2.1)	0.9 (0.3-2.4)	0.8 (0.4-1.8)	0.5 (0.2-1.6)
risk for externalizing disorder	1.2 (0.5-2.7)	1.0 (0.3-3.0)	1.3 (0.5-3.1)	1.0 (0.3-3.7)
risk for substance use disorder	0.9 (0.2-3.7)	0.9 (0.2-5.2)	1.1 (0.2-4.7)	1.7 (0.2-13.1)
IED item positive	1.4 (0.4-4.3)	1.6 (0.4-6.8)	1.1 (0.3-3.8)	1.2 (0.2-5.7)
(hypo)mania item positive	3.0 (1.0-8.9)	4.2 (0.9-20.0)	3.2 (1.0-10.6)	4.2 (0.7-24.7)
any eating disorder item positive	0.9 (0.3-2.6)	1.2 (0.4-3.9)	0.8 (0.3-2.4)	1.0 (0.3-3.8)
any psychotic item positive	1.0 (0.3-3.6)	0.8 (0.2-3.8)	1.0 (0.3-3.7)	0.8 (0.1-4.8)
non-suicidal self-injury	2.3 (0.7-7.2)	5.7* (1.7-18.5)	1.8 (0.5-6.2)	3.6 (0.9-14.9)

V. Severity markers of pre-matriculation STB

Twelve-month STB at baseline	1.8 (0.7-4.4)	4.7* (1.4-15.9)
Pre-matriculation lifetime STB		
- no pre-matriculation suicide plans or attempts (i.e., ideation only) ^d	(ref)	(ref)
- pre-matriculation suicide plans; no attempts	1.7 (0.8-3.6)	2.5 (1.0-6.5)
- pre-matriculation suicide attempts	3.5 (0.7-18.6)	11.1* (1.4-87.4)
STB characteristics in worse week of pre-matriculation lifetime STB		
duration STB 4 days or more/week	0.9 (0.4-2.0)	0.7 (0.2-2.0)
duration STB 5 hours or more/day	1.4 (0.3-6.6)	2.2 (0.4-13.5)
control STB very difficult/impossible	1.0 (0.3-3.1)	0.9 (0.2-3.8)
any STB-associated risky behavior	0.8 (0.3-1.8)	0.7 (0.2-2.2)

Course of pre-matriculation lifetime STB		
duration 5 years or more	1.2 (0.5-2.9)	1.5 (0.5-4.9)
remission at college entrance 3 years or less	1.1 (0.4-2.9)	2.0 (0.5-9.1)

Note: significant OR are shown in bold and are marked with * ($\alpha=0.05$).

^a The multivariate associations are based on a model including all predictors shown in the corresponding column.

^b no STB during follow-up is the reference category

^c High degree of parental education defined as holding a college bachelor degree or more.

^d Non-intact familial composition defined as parents being divorced or separated.

^e Students with a pre-matriculation history of ideation but not plans or attempts are the reference category for the 3-category predictor

Abbreviations: STB = GSE = general secondary education; IED = intermittent explosive disorder; OR = Odds ratio; Suicidal Thoughts and Behaviors.

Supplementary eTable 2. Multivariate population-level associations between risk factors under study and adverse clinical patterns of STB during follow-up.

	<u>MULTIVARIATE MODEL 1^a</u>		<u>MULTIVARIATE MODEL 2^a</u>		<u>MULTIVARIATE MODEL 3^a</u>		<u>MULTIVARIATE MODEL 4^a</u>		<u>MULTIVARIATE MODEL 5^a</u>	
	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>	<u>One-time</u> <u>STB^b</u> <u>PARP</u>	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>	<u>One-time</u> <u>STB^b</u> <u>PARP</u>	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>	<u>One-time</u> <u>STB^b</u> <u>PARP</u>	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>	<u>One-time</u> <u>STB^b</u> <u>PARP</u>	<u>Two-time</u> <u>STB^b</u> <u>PARP</u>
<u>I. Socio-demographic variables</u>										
Being male	-3.8	2.6	-3.5	5.2	-3.8	3.4	-3.1	5.3	-3.0	4.5
Age > 18 years	0.7	12.7*	0.5	11.6*	0.5	10.2*	0.7	8.7	0.7	7.4
Non-Belgian nationality	-0.4	-2.6	-0.3	-3.3	-0.3	-3.6	-0.3	-3.5	-0.2	-1.8
Parents' financial situation difficult	0.4	-2.5	0.6	-3.8	0.8	-2.8	0.8	-3.2	0.8	-4.4
Parental education ^c										
- both parents high	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
- only one parent high	-1.2	1.3	-1.1	1.3	-0.9	1.2	-0.7	0.9	-1.0	0.5
- none of parents high	-1.2	4.6	-1.2	4.6	-0.8	3.8	-0.7	3.8	-0.6	4.5
Non-intact familial composition ^d	-0.7	2.3	-0.7	0.3	-1.4	-1.7	-1.5	-1.4	-1.4	-0.6
Non-heterosexual orientation	0.5	4.0	0.8	2.6	0.8	3.4	1.2	-1.1	1.1	-2.2
<u>College-related socio-demographics</u>										
University Group membership										
- Human Sciences	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
- Science & Technology	-0.1	-0.9	-0.1	-1.3	-0.1	-1.2	-0.2	-0.3	-0.3	0.5
- Biomedical Sciences	-0.6	1.6	-0.7	1.4	-0.6	0.9	-0.5	0.5	-0.5	1.4
Non-GSE pre-educational level	-0.7	-3.5	-0.6	-3.5	-0.8	-4.3	-0.7	-4.3	-0.8	-4.5
Living with parents	-1.7	-2.6	-1.2	-1.4	-1.2	-3.4	-1.3	-2.5	-1.3	-2.8
<u>II. Traumatic experiences (< age 17)</u>										
parental psychopathology			-1.6	6.2	-1.6	6.1	-1.7	6.0	-1.6	5.8
physical abuse			0.2	5.6	0.5	4.4	0.4	4.7	0.4	2.6
emotional abuse			1.3	-0.4	1.6	-2.9	1.9	-3.9	1.6	-3.7
sexual abuse			0.2	3.9	0.3	3.7	0.2	3.4	0.2	3.4
neglect			-1.4	0.1	-1.3	-2.5	-1.2	-1.7	-1.3	-2.3
bully victimization			-2.5	-0.5	-2.5	1.2	-2.4	-0.5	-2.7	-0.5
dating violence			-0.1	-1.2	0.0	-2.6	0.2	-3.5	0.3	-3.8
<u>III. Twelve-month stressful experiences</u>										
life-threatening illness or injury of a friend or family member					0.1	-4.7	0.3	-4.0	0.3	-4.2
death of a friend or family member					0.7	7.6	0.7	6.7	0.7	4.2
break-up with a romantic partner					0.4	-0.6	0.2	-1.3	0.2	-0.8
romantic partner cheated					0.3	-1.6	0.3	-1.4	0.2	-2.1
serious betrayal someone else than partner					-2.7	4.0	-2.1	1.8	-2.1	1.6
serious ongoing arguments/break-up with friend or family					0.9	5.5	0.8	6.1	0.8	4.1

life-threatening accident	-0.5	1.0	-0.5	0.8	-0.5	1.0
seriously physically assaulted	-0.4	2.1	-0.3	1.6	-0.3	1.3
sexually assaulted or raped	-0.6	1.1	-0.5	0.8	-0.6	0.3
any serious legal problem	0.7	3.6	0.7	3.4	0.6	2.9
IV. Twelve-month mental disorders						
risk for internalizing disorder			1.0	-0.3	0.7	-5.1
risk for externalizing disorder			-0.9	-0.4	-1.2	-0.3
risk for substance use disorder			0.1	-0.5	0.3	1.2
IED item positive			0.1	3.2	0.2	1.1
(hypo)mania item positive			-2.1	6.0	-2.2	5.3
any eating disorder item positive			0.6	1.3	0.5	-0.8
any psychotic item positive			-0.4	-1.6	-0.4	-1.3
non-suicidal self-injury			-0.2	8.7*	-0.1	4.9
V. Severity markers of pre-matriculation STB						
Twelve-month STB at baseline					0.5	12.3*
Pre-matriculation lifetime STB						
- no pre-matriculation suicide plans or attempts (i.e., ideation only) ^d					(ref)	(ref)
- pre-matriculation suicide plans; no attempts					-1.9	7.9
- pre-matriculation suicide attempts					-0.1	7.2*
STB characteristics in worse week of pre-matriculation lifetime STB						
duration STB 4 days or more/week					-1.0	-3.0
duration STB 5 hours or more/day					0.5	2.4
control STB very difficult/impossible					-0.6	-1.0
any STB-associated risky behavior					1.1	-2.1
Course of pre-matriculation lifetime STB						
duration 5 years or more					0.3	3.6
remission at college entrance 3 years or less					1.1	4.7

Note: significant PARPs are shown in bold and are marked with * ($\alpha=0.05$).

^a The multivariate associations are based on a model including all predictors shown in the corresponding column.

^b no STB during follow-up is the reference category

^c High degree of parental education defined as holding a college bachelor degree or more.

^d Non-intact familial composition defined as parents being divorced or separated.

^e Students with a pre-matriculation history of ideation but not plans or attempts are the reference category for the 3-category predictor

Abbreviations: STB = GSE = general secondary education; IED = intermittent explosive disorder; OR = Odds ratio; Suicidal Thoughts and Behaviors.

Supplementary eTable 3. Model fit statistics and prediction accuracy measures of multivariate prediction models for adverse clinical patterns of STB during follow-up.

	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5	
	One-time	Two-time	One-time	Two-time	One-time	Two-time	One-time	Two-time	One-time	Two-time
	STB	STB	STB	STB	STB	STB	STB	STB	STB	STB
Akaike Information Criterion	482.37	459.60	467.36	427.10	441.93	380.37	418.25	333.22	395.37	271.15
Bayes Information Criterion	533.49	510.63	546.00	505.62	559.90	498.14	567.68	482.40	580.19	455.66
Nagelkerke pseudo-R ² (%)	4.5	10.1	6.9	17.4	11.4	28.0	14.1	37.4	16.9	51.9
Area-under-the-Curve (SE) ^a	0.60 (0.03)	0.66 (0.04)	0.63 (0.03)	0.71 (0.04)	0.67 (0.04)	0.77 (0.03)	0.69 (0.04)	0.81 (0.03)	0.71 (0.03)	0.87 (0.03)
Area-under-the-Curve (SE) ^b	0.50 (0.05)	0.59 (0.05)	0.51 (0.05)	0.64 (0.05)	0.53 (0.05)	0.69 (0.04)	0.53 (0.05)	0.72 (0.04)	0.52 (0.05)	0.79 (0.04)
Sensitivity (SE) ^{a,c}	16.8 (4.3)	19.5 (4.2)	18.4 (4.5)	23.5 (4.4)	20.8 (4.6)	26.8 (4.5)	21.7 (4.6)	29.4 (4.6)	22.9 (4.6)	32.9 (4.7)
Sensitivity (SE) ^{b,c}	10.9 (4.5)	15.3 (4.3)	11.4 (4.4)	19.0 (4.5)	12.5 (4.4)	21.6 (4.6)	12.4 (4.3)	23.4 (4.6)	12.0 (4.3)	27.1 (4.6)
Positive Predictive Value (SE) ^{a,d}	43.2 (9.8)	51.3 (10.2)	47.8 (10.2)	63.1 (10.3)	54.9 (10.4)	72.2 (9.8)	57.6 (10.3)	79.1 (9.1)	60.8 (10.3)	88.3 (7.0)
Positive Predictive Value (SE) ^{b,d}	28.1 (11.0)	40.4 (11.1)	29.8 (11.1)	51.3 (11.9)	33.1 (11.4)	58.2 (11.7)	33.0 (11.3)	63.2 (11.4)	31.9 (11.5)	73.1 (10.5)

^a calculated with cross-validated predicted probabilities obtained through leave-one-out cross-validation

^b calculated with cross-validated predicted probabilities obtained through leave-one-out cross-validation

^c Sensitivity = Proportion of (high-)persistent STB outcome cases found among the 10% of respondents with highest predicted probabilities.

^d Positive Predictive Value = Probability of effectively developing (high-)persistent STB when being among the 10% of respondents with highest predicted probabilities.