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COVID-19 and depressive symptoms in students before and during lockdown

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COVID-19 and depressive symptoms in students before and during lockdown

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ABSTRACT

The lockdown due to coronavirus pandemic may exacerbate depressive symptoms, experts argue. Here we report that students, a high-risk category for mental disorders, report on average worse depressive symptoms than six months before isolation. The prospective data reported herein should alert clinician of a possible aggravation as well as new-onsets of depressive symptoms in students.

The current coronavirus pandemic has been affecting Europe since late February 2020, forcing governments to put citizens in lockdown. Among growing concerns of the effects of isolation on mental health[1,2], only retrospective data are available to assess if actual changes occur[3]. Here we provide prospective evidence of a change in depressive symptomatology of Italian students during COVID-19-related lockdown.

The study was approved by the University of Padova Ethical Committee of Psychology and participants provided informed consent. Between October 3rd and October 23rd 2019, we introduced the study to approximately 1000 University of Padova students, 153 of which matched target population characteristics (Italian native speaker students, age 18-30) and completed a demographic questionnaire and the Italian version of Beck Depression Inventory-2[4] (BDI-2, a validated self-report questionnaire for depressive symptoms evaluation, the score of which correlates with severity of depressive symptomatology) online[5], both in October and in April (between 3rd-23rd) 2020. We implemented generalised linear mixed models to evince if BDI-2 score changed during isolation with respect to the scores reported 6 months before. To assess a percentage change in BDI-2 score, we defined %ΔBDI-2 as the difference between BDI-2 score during lockdown and before lockdown, the whole divided by BDI-2 score before lockdown + 1 and analysed %ΔBDI-2 with linear mixed-effects models. To assess clinically relevant changes in depressive symptoms, we employed multinomial regression models. Sample characteristics and models employed are reported in Tables A and B, respectively. Anonymised dataset, further details on data analysis, and script are provided as Supplementary Material.

BDI-2 total score is slightly higher during lockdown than before (Figure, A and Table). We recorded that the median percentage increase is higher in males (+36%; IQR = -12 – 91%) than in females (+16%; -26 – 89%) and is independent from a history of mental disorder (Figure, B), although students with such history report higher before and during lockdown BDI-2 scores than students without any established diagnosis of psychopathology (Figure, C and Table). This increase is not significantly linked to sex, familiarity for a mental disorder, worry for one's economic situation, or residence. Statistically, it is significantly linked to BDI-2 score before lockdown (Figure, D) and age, evidencing that younger participants with lower BDI-2 score before lockdown report higher percentage increases in BDI-2 score during lockdown. To assess if such increase could be clinically relevant, we divided participants into three clinically useful categories according to BDI-2 scores before lockdown (below 90th percentile, above 95th percentile, and between these two ranges[4]) and tested how many participants switched from one category to another, or remained in the same one during lockdown. We fit the observed data to a multinomial regression model and found that a median increase of 22% in BDI-2 score (IQR= -21 – 90%) would not clinically affect 79,2% of our target population (IQR = 74,7 – 81,4%); 8,2% (6,9 – 9,8%) would progress to a more serious clinical category (either from < 90th to 90th-95th range or from this latter to > 95th); and 6,2% (5,3 – 7,2%) would directly progress from < 90th percentile category to the most severe clinical category (Figure, E and F). Less than 5% of participants would improve.

As Italy was entirely put in lockdown, it is impossible to assess isolation-independent changes in BDI-2 score. Students could be diversely affected by lockdowns: isolation may be responsible of a median increase of 22% in BDI-2 score, which would be clinically relevant for up to ≈ 15% of our target population. Our data should alert clinicians of possible aggravation of depressive symptoms in students, independently from a history of mental disorder.

Author contributions: All authors designed the study protocol, interpreted data and critically revised the manuscript; N.M. acquired data and analysed it and drafted the manuscript; P.R., F.V. C.N., S.P. provided technical, material or administrative support to the study; F.V., C.N., S.P. provided their supervision and expertise.

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Additional Information: Dataset and R Script for analysis are provided as Supplementary Material

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Figure Legend. Possible COVID-19-related isolation impact on depressive symptomatology

Pink dots = females individual scores; blue dots = males individual scores. Pointrange represents median ± interquartile range. A, BDI-2 total score before and during lockdown. B, Percentage increase in BDI-2 scores. C, BDI-2 score stratified according to history of mental disorder. D, regression lines of percentage increase in BDI-2 score with respect to BDI-2 score before the lockdown. E, estimated probabilities of depressive symptoms stability (no clinical change) before-during lockdown as a function of percentage increase in BDI-2 score. F, estimated probabilities that depressive symptoms get worse (clinical category change); blue triangles = estimated probability of a steep worsening (from category below 90^{th} percentile, characterised by mild or no symptoms, to the most severe clinical category - higher than 95^{th} percentile); yellow triangles = estimated probability of worsening either from below 90^{th} percentile to 90^{th}-95^{th} or from the latter range to above 95^{th} percentile; gray-shaded area = estimated probabilities for a 0-200% increase in BDI-2 score.

123 **TABLE**

Table. Sample characteristics and regression models employed

A Sample characteristics

	Females without disorder history	Females with disorder history	Females	Males without disorder history	Males with disorder history	Males	TOT
N (during lockdown)	90	29	119	30	4	34	153
Age (mean ± sd)	22.0 ± 1.8	22.4 ± 1.5	22.1 ± 1.7	22.4 ± 2.3	22 ± 1.1	22.3 ± 2.2	22.2 ± 1.8
BDI-2 score before lockdown (median; IQR)	8; 4 – 15	14.5; 6.25 – 24.8	8; 5 – 17	7; 2 – 13	9; 9 – 9	7.5; 2.5 – 12.8	8; 4 – 16
BDI-2 score during lockdown (median; IQR)	9; 4 – 16	13; 8 – 26	10; 4 – 18	10.5; 3 – 18.5	6; 3.75 – 15.8	9; 3 – 18.5	10; 4 – 18
% ΔBDI-2 (median; IQR)	24%; -27 – 100	0%; -25 – 33	16%; -26 – 89	36%; -12 – 91	21%; -25 – 115	36%; -12 – 91	22%; -21 – 90

B Regression models

BDI-2 score model refers to Figure, A	df	ΔAIC to null model	Significance of predictors
BDI-2 Score ~ Lockdown : Sex + Sex	6	14.6	Males:DuringLockdown, $p < 0.001$ ($\beta = 0.27 \pm 0.07$) Females:DuringLockdown, $p = 0.019$ ($\beta = 0.08 \pm 0.03$) Males, n.s. ($p = 0.052$)

BDI-2 score model refers to Figure, C	df	ΔAIC to null model	Significance of predictors
BDI-2 Score ~ DisorderHistory : Lockdown + DisorderHistory	6	26.5	No_DisorderHistory, $p < 0.001$ ($\beta = -0.44 \pm 0.12$) No_DisorderHistory:DuringLockdown, $p < 0.001$ ($\beta = 0.19 \pm 0.04$) DisorderHistory:DuringLockdown, n.s. ($p = 0.18$)

%ΔBDI-2 model refers to Figure, B and D	df	ΔAIC to null model	Significance of predictors
%ΔBDI-2 ~ BDI-2 score before Lockdown	5	15.3	BDI-2 score before Lockdown, $p < 0.001$ ($\beta = -0.05 \pm 0.01$)
%ΔBDI-2 ~ Age	4	2.26	Age, $p = 0.039$ ($\beta = -0.16 \pm 0.07$)

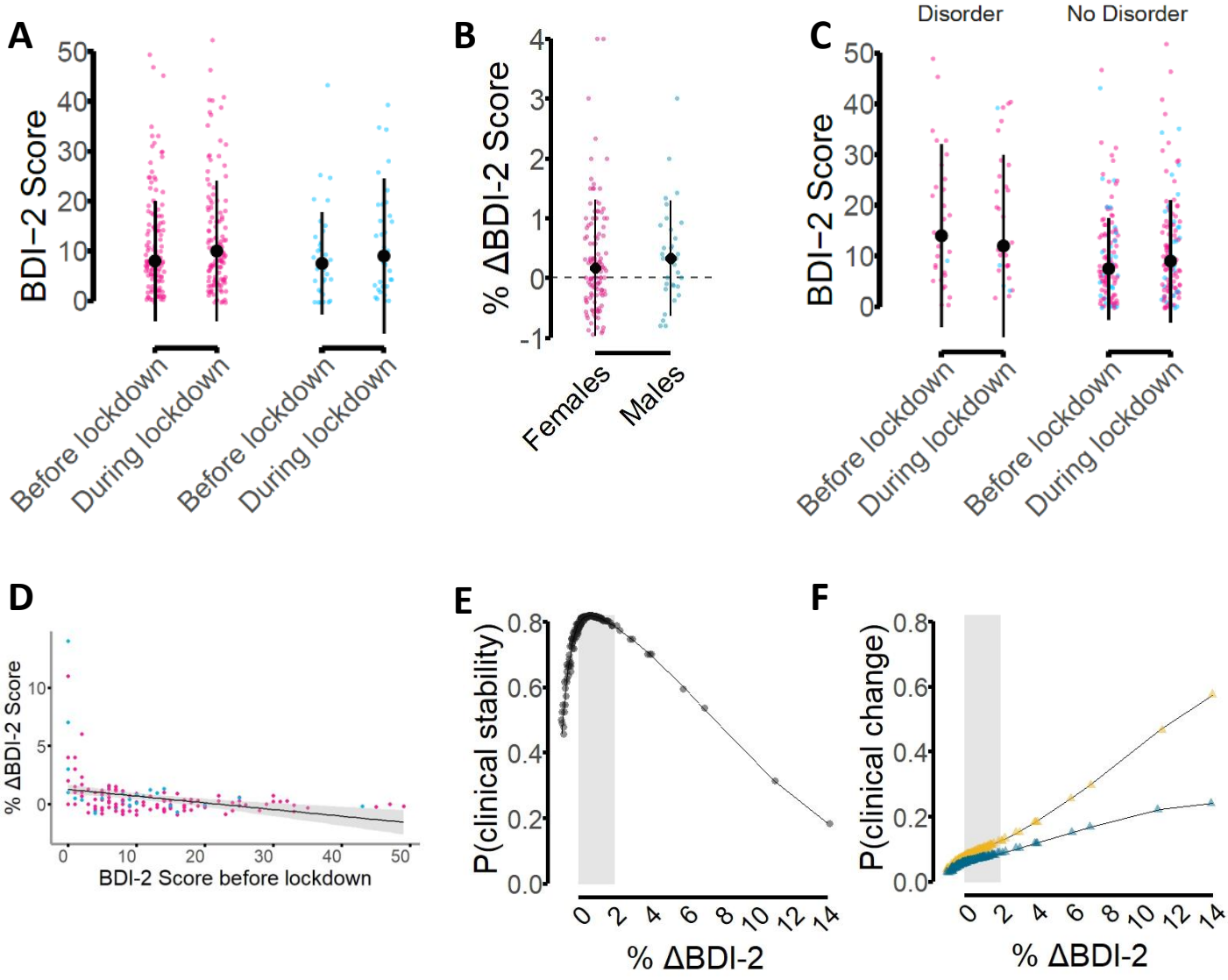
124 Abbreviations and symbols: IQR = interquartile range; sd = standard deviation; null model =

125 regression model with no predictors; AIC = Akaike Information Criterion; ΔAIC = difference

126 between null model and better model AIC; df = degrees of freedom of a model; ":" means

127 interaction between predictors; β = estimated regression coefficient ± sd ;n.s. = not significant.

128 Further details on models can be found in supplementary material.


A
BDI−2 Score
Before lockdown
During lockdown
Before lockdown
During lockdown
B
% ΔBDI-2 Score
Females
Males
C
Disorder
No Disorder
BDI−2 Score
Before lockdown
During lockdown
Before lockdown
During lockdown
D
% ΔBDI-2 Score
BDI-2 Score before lockdown
E
P(clinical stability)
% ΔBDI-2
F
P(clinical change)
% ΔBDI-2