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**Suicidal risk and impulsivity-related traits among young Argentinean college students during a quarantine of up to 103-days duration: Longitudinal evidence from the COVID-19 pandemic**

**Suicide risk and impulsivity during quarantine**

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## **ABSTRACT**

### **Aim**

This study aimed to examine longitudinal changes on suicidal risk levels, adjusting for impulsivity-related traits, quarantine duration, main demographic factors, mental disorder history, and loneliness, in young Argentinean college students with (ideation; attempt) and without suicidal behavior history, during a quarantine of up to 103 days-duration of the COVID-19 pandemic.

### **Methods**

A longitudinal design with two-repeated measures was used (N = 1202). Follow up was a month later from the first measurement. Three groups were analyzed: with suicidal ideation history, with suicide attempt history, and without suicidal behavior history.

### **Results**

Percentages of college students with high or moderate suicidal risk were alarming (accumulated: 62.23% first measurement, 57.65% second measurement). Multilevel analysis on the three groups showed that suicidal risk diminished from the first measurement to the follow up, having mental disorder history predicted higher suicidal risk, and negative urgency had the largest increasing effects on suicidal risk which persisted over time.

### **Conclusions**

Suicidal risk widely affects college students during lengthy quarantines of the COVID-19 pandemic and it should be tracked in those having pre-existing vulnerabilities, but also in those without. Education on managing negative emotions may help decrease suicide risk in college students during the COVID-19 pandemic.

### **KEYWORDS**

Suicide, attempted; Suicidal ideation; Impulsivity; Mental disorders; Multilevel analysis

## INTRODUCTION

Assessing suicidal risk and behaviors in vulnerable groups, mainly via longitudinal studies, is one of the immediate research priorities for mental health science during the COVID-19 pandemic (Holmes et al., 2020). Young college students are a particularly vulnerable group to suffer from the negative impact of the COVID-19 pandemic and restrictive measures such as quarantine. During this pandemic, sanitary restrictions including daily life disruptions were necessary to break the contagion rate. College closures were suddenly implemented and education shifted to an emergency online learning format, which may exacerbate negative mental health outcomes among students (Grubic et al., 2020; Sahu, 2020). However, longitudinal studies assessing suicidal risk in college students during quarantines due to the COVID-19 pandemic are lacking.

Earlier research has demonstrated that being a woman, younger (Gomes et al., 2019), and having a mental disorder background (Park et al., 2018), are associated with increased suicide risk. Likewise, loneliness associates to increased suicide risk and behaviors both in non-pandemic (Chang et al., 2010; Wong et al., 2019) and pandemic contexts (Killgore et al., 2020). Furthermore, all these variables are pre-quarantine predictors for developing mental disorders under quarantine conditions, and the longest quarantines relate to the worst outcomes (Brooks et al., 2020).

While there is consensus that impulsivity is a key feature of several mental disorders (Moeller et al., 2001) and is related to risky behaviors (Bakhshani, 2014) mainly among young people (Reynolds et al., 2019), little is known regarding which impulsivity traits are particularly related to suicide attempts (Klonsky et al., 2016). Furthermore, evidence on the relationship between impulsivity and suicidal behaviors are contradictory, either supporting such a relationship (Klonsky & May, 2010) or suggesting that it would actually be small (Anestis et al., 2014). Research has also found that most impulsivity traits are similar between suicide attempters and ideators-only, while both would have higher impulsivity than those without suicidal behavior history (Klonsky & May 2010). However, the effects of

both suicidal background and impulsivity traits on suicidal risk were not yet assessed during the unprecedented COVID-19 pandemic and under lengthy quarantine conditions.

We hypothesize that suicidal risk would be high among college students during restrictive and lengthy quarantines due to the COVID-19 pandemic, and would increase as quarantine prolongs in those having pre-existing vulnerabilities, particularly with suicide attempt history and suicidal ideation history. Our second hypothesis suggests that the following features would be positively related to higher suicidal risk: being impulsive, being a woman, being younger, longer and more restrictive quarantine, having a mental disorder history, and living alone. In addition, we expect that relationships between suicidal risk and impulsivity traits would be stable over time. Therefore, this study is aimed to examine longitudinal changes on suicidal risk levels, adjusting for impulsivity-related traits, quarantine duration, main demographic factors, mental disorder history, and loneliness, in young Argentinean college students with (ideation; attempt) and without suicidal behavior history, during a quarantine of up to 103 days-duration of the COVID-19 pandemic.

## **METHODS**

### **Study design and participants**

This study used a longitudinal design, with two-repeated measures. Sampling was one of convenience. The attrition to the second measurement was 40.90%. Suicidal risk (at time 1) differed between those who completed both measurements and those who completed only the 1<sup>st</sup> assessment, except in the group without suicidal behavior history (**Table S1**). The sample were 1202 young college students, aged 18-25 (Mean<sub>age</sub> = 21.47, standard deviation [SD] 2.08) that completed the survey for the two-repeated measures. Further descriptions of the sample are in **table 1**.

### **Procedure**

Data collection was carried out via online using the LimeSurvey software. For the first measurement, this study was disseminated via social networks since three days before the Argentinean quarantine started and throughout the first 103 days of this quarantine (17

March to 30 June, 2020). No personal identification data was asked of participants during the survey except for an email to contact participants a month later for the follow-up survey. All participants gave their informed consent prior to participation. Safety procedures included a feedback email to each subject after participation, which contained the scores obtained in each instrument along with a brief description on what these scores mean, and contact information on mental health services available free of charge. These emails also had the function of raising mental health status self-awareness.

### **Ethics**

The Ethics Committee of the Institute of Psychological Research, Faculty of Psychology, National University of Córdoba (CEIIPsi-UNC-CONICET) approved this study (14/02/20-23/03/20).

### **Measurements**

*Suicidal risk.* We used the Inventory of Suicide Orientation (ISO-30; King & Kowalchuk, 1994), in its Argentinean validation (Fernández Liporace & Casullo, 2006). We adopted the following suicidal risk cut off scores: < 30 *low*, between 30-44 *moderate*, and  $\geq 45$  *high* (King & Kowalchuk, 1994).

*Impulsivity-related traits.* We used the Argentinean validation (Pilatti et al., 2015) of the short Spanish version (Verdejo García et al., 2010) of the Impulsive Behavior Scale (UPPS-P; Whiteside & Lynam, 2001), composed of five subscales measuring: *negative urgency* (NEGURG, i.e., the tendency to act impulsively when experiencing negative affect), *lack of premeditation* (PREMED, i.e., the tendency to act without reflection on the consequences of an action), *lack of perseverance* (PERSEV, i.e., the ability to remain with a task until completion and to avoid boredom), *sensation seeking* (SENSEEK, i.e., the tendency to seek new and exciting experiences and sensations) (Whiteside & Lynam, 2001), and *positive urgency* (POSURG, i.e., the tendency to act impulsively when experiencing positive affect) (Cyders et al., 2007).

*Sex.* We asked for the participant's biological sex: *woman, man*.<sup>1</sup>

*Age.* We grouped participants' age into two categories: *adolescent* (18-21 years old), *young* (22-25 years old).

*Quarantine duration.* The response dates were automatically recorded by the survey software. Based on the date of response for the first measurement, the participants' answers were assigned to one of four categories: *baseline* or *0-days duration* (participants answering during the three days before the quarantine started: 17-19 March 2020); strongly restrictive quarantine of up to *10-days duration* (20-29 March); strongly restrictive quarantine of up to *50-days duration* (30 March-8 May); less restrictive quarantine of up to *103-days duration* (9 May-30 June).

*Mental disorder history.* We asked participants: "Have you ever been diagnosed with a mental problem (for example: depression, anxiety, obsession, or any other)?" Answer options were dichotomous: yes, no.

*Loneliness* (as being alone). We used a single item to ask if participants were living alone or accompanied during quarantine.

*Suicidal behavior history.* We asked participants: "Have you ever attempted suicide or have you ever thought about it?". Answer options were: I have attempted suicide (one or more times); I have thought about killing myself, but I have never attempted suicide; No, I have never attempted suicide nor have thought about it. These answer options were mutually exclusive (*suicidal ideation history, suicide attempt history, without suicidal background*).

## **Data analysis**

We performed all data analysis with RStudio version 4.0.3 (R Core Team, 2020). Reproducible R code is deposited at an open online repository (López Steinmetz, 2021). Statistical significance was set at  $p < .05$ . P-values under .001 are reported as  $< .001$ .

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<sup>1</sup> In this study, only two options were given for sex (woman, man). However, further work would benefit from adding non-binary categories.

Skewness, kurtosis (**Table S2**), and multicollinearity (**Table S3**) were assessed to be in the range of acceptable values for parametric tests.

We calculate descriptive measures and paired Student's t-Test for both suicidal risk and impulsivity-related traits. To address the main aim of this research, we ran mixed effects modeling by means of the multilevel approach for suicidal risk as the outcome variable. We analyzed models including random (intercepts) and fixed effects in a three-level hierarchical data structure. In the random part of the model, we included two-repeated measures (level 1) nested within participants (level 2) and, in turn, nested within suicidal behavior history (level 3). In the fixed part of the model, we tested the following predictors as additive effects: time (or first and second measurement), sex, age, quarantine duration, mental disorder history, loneliness, and the five impulsivity-related traits as measured in the first time. For the predictor having more than two conditions, we have set non-orthogonal contrasts, which compared the baseline versus each one of the remaining conditions.

The first model only contained the intercept. Models were built by adding one predictor at a time to test the overall main effect of each predictor. Finally, to test the stability of the main effects of impulsivity-related traits on suicidal risk, this entire process was repeated, but considering the measurements of impulsivity-related traits during the follow up.

We used the *nlme* package (Pinheiro et al., 2020) with the maximum likelihood (ML) method. Comparisons on the fit of the models were based on the Akaike Information Criterion (AIC). For calculating effect sizes (ES) we used the *DSUR.noof* package (Aufheimer, 2021). We adopted the Cohen's ES conventions: 0.02 small, 0.15 medium, and 0.35 large ES (Cohen, 1992). Since all items were marked as mandatory during data collection, there were no missing data to handle.

## **RESULTS**

### **Descriptive measures**

In the entire sample during the first measurement, 30.78% scored as high suicidal risk, 31.45% scored as moderate, and 37.77% as low risk. During the follow up, these



percentages were of 28.78%, 28.87%, and 42.35%, correspondingly (see also **Table S4**). Suicidal risk and NEGURG scores significantly decreased from the first measurement to the follow up. In addition, SENSEEK decreased in the entire sample and in the groups without suicidal behavior history and with suicidal ideation history, while POSURG decreased in the group with suicide attempt history (**Table 2**). Score distributions of suicidal risk and impulsivity-related traits in young college students grouped by suicidal behavior history are shown in **Figure 1**.

### **Assessing the need for multilevel modelling**

The model fit for suicidal risk significantly improved when the variability in intercepts across suicidal behavior history was modeled ( $AIC_{\text{intercept\_only}} = 20471.45$ ,  $AIC_{\text{random\_intercept}} = 19811.64$ ;  $X^2_{(3)} = 661.82$ ,  $p < .001$ ). Likewise, the fit improved when within-person changes were modeled ( $AIC_{\text{within\_variable}} = 18464.32$ ;  $X^2_{(4)} = 1349.31$ ,  $p < .001$ ).

### **Multilevel modelling considering impulsivity-related traits measured during the first measurement**

In the entire sample, when models were built adding one predictor at a time, there were significant main effects of the time ( $X^2_{(5)} = 27.73$ ,  $p < .001$ ), age ( $X^2_{(7)} = 5.12$ ,  $p = .02$ ), mental disorder history ( $X^2_{(11)} = 33.93$ ,  $p < .001$ ), NEGURG ( $X^2_{(13)} = 294.54$ ,  $p < .001$ ), PERSEV ( $X^2_{(15)} = 29.59$ ,  $p < .001$ ), PREMED ( $X^2_{(16)} = 15.86$ ,  $p < .001$ ), and SENSEEK ( $X^2_{(17)} = 11.62$ ,  $p = .001$ ) on suicidal risk. On the contrary, the levels of suicidal risk did not differ between the sexes ( $X^2_{(6)} = 3.07$ ,  $p = .08$ ), the quarantine duration ( $X^2_{(10)} = 4.83$ ,  $p = .18$ ), those living alone or accompanied ( $X^2_{(12)} = 0.15$ ,  $p = .69$ ), and by POSURG ( $X^2_{(14)} = 2.10$ ,  $p = .15$ ).

After all the predictors were included into the model, suicidal risk showed significant variance in intercepts across suicidal behavior history (SD = 5.87; 95% CI: 2.59, 13.34) and across participants (SD = 11.17; 95% CI: 10.66, 11.70). The effect of age did not remain as significant in this final model. Suicidal risk was negatively related to the time (ES: 0.15), while was positively related to having mental disorder history (ES: 0.14). NEGURG (ES: 0.40) principally, and the lack of both PERSEV (ES: 0.08) and PREMED (ES: 0.12) were positively

related to suicidal risk, whilst SENSEEK was negatively related to suicidal risk (ES: 0.10). A summary of this final model is shown in **table 3a**.

A similar model was run in each group of suicidal behavior history, separately (**Table 4**). For those without suicidal behavior history, the variance in intercepts across participants was SD = 9.46 (95% CI: 8.84, 10.12). The effect of time (ES: 0.10) and the levels of SENSEEK (ES: 0.12) were negatively related to suicidal risk. Having mental disorder history (ES: 0.14) and, mainly, the levels of NEGURG (ES: 0.41), but also of POSURG (ES: 0.14), PERSEV (ES: 0.14), and PREMED (ES: 0.09) were positively related to suicidal risk.

For those with suicidal ideation background, the variance in intercepts across participants was SD = 12.56 (95% CI: 11.71, 13.47). The effect of time was negatively related to suicidal risk (ES: 0.17), while the effects of having mental disorder history (ES: 0.09) and the levels of both NEGURG (ES: 0.36) and PREMED (ES: 0.13) were positively related to suicidal risk.

For those having suicidal attempt history, the variance in intercepts across participants was SD = 10.61 (95% CI: 8.83, 12.73). The effect of time was negatively related to suicidal risk (ES: 0.26). Also, the quarantine duration was negatively related to suicidal risk, but only when comparing the baseline (Mean = 51.18, SD = 16.76) versus the less restrictive quarantine of up to 103-days duration (Mean = 43.64, SD = 21.08) (ES: 0.24). Having mental disorder history (ES: 0.34) and the levels of NEGURG (ES: 0.47) were positively related to suicidal risk.

#### **Multilevel modelling considering impulsivity-related traits measured during the follow up**

In the entire sample, logically, the main significant effects of the time, age, and mental disorder history as well as the main non-significant effects of the sex, quarantine duration, and loneliness, were the same as reported above. Considering the levels of impulsivity-related traits measured during the follow up, the main effects of NEGURG ( $X^2_{(13)} = 338.39$ ,  $p < .001$ ), PERSEV ( $X^2_{(15)} = 39.98$ ,  $p < .001$ ), PREMED ( $X^2_{(16)} = 16.57$ ,  $p < .001$ ), and SENSEEK ( $X^2_{(17)} = 11.56$ ,  $p = .001$ ) on the suicidal risk remained as significant, while the main effect of POSURG remained as non-significant ( $X^2_{(14)} = 0.78$ ,  $p = .38$ ).

After all the predictors were included into the model, suicidal risk showed significant variance in intercepts across suicidal behavior history (SD = 6.15; 95% CI: 2.72, 13.89) and across participants (SD = 10.88; 95% CI: 10.38, 11.40). The effect of age did not remain as significant in this final model. Suicidal risk was negatively related to the time (ES: 0.15) and positively related to having mental disorder history (ES: 0.16). The main relationships found for suicidal risk and impulsivity-related traits measured during the first time were also found with these same traits measured during the follow up, although with slightly different ESs (NEGURG: 0.43, PERSEV: 0.11, PREMEDI: 0.12, SENSEEK: 0.10). A summary of this final model is in **table 3b**.

A similar model was run in each group of suicidal behavior history (**Table 5**). For those without suicidal behavior history, the variance in intercepts across participants was SD = 9.19 (95% CI: 8.59, 9.84). The time (ES: 0.10) and the levels of SENSEEK (ES: 0.11) were negatively related to suicidal risk. Having mental disorder history (ES: 0.15) and, mainly, the levels of NEGURG (ES: 0.47), but also of POSURG (ES: 0.09), and PERSEV (ES: 0.15) were positively related to suicidal risk.

For those with suicidal ideation background, the variance in intercepts across participants was SD = 12.31 (95% CI: 11.47, 13.20). The time was negatively related to suicidal risk (ES: 0.17), while having mental disorder history (ES: 0.12) and the levels of both NEGURG (ES: 0.39) and PERSEV (ES: 0.11) were positively related to suicidal risk.

For those having suicidal attempt history, the variance in intercepts across participants was SD = 9.86 (95% CI: 8.15, 11.93). The time was negatively related to suicidal risk (ES: 0.26). Having mental disorder history (ES: 0.43) and the levels of both NEGURG (ES: 0.44) and PREMEDI (ES: 0.42) were strong and positively related to suicidal risk.

## **DISCUSSION**

This study provides the first evidence based in a Latin American country on within-person changes in suicide risk levels of young college students with (ideation; attempt) and without suicidal behavior history during a lengthy quarantine of up to 103 days-duration due to the COVID-19 pandemic.

As hypothesized, percentages of college students scoring as high and also as moderate suicidal risk were alarmingly elevated during the lengthy Argentinean quarantine, but, contrary to our hypothesis, diminished from the first (accumulated 62.23%) to the second measurement (accumulated 57.65%). Previous evidence on suicidal risk in Argentinean college students is lacking; thus, it is unknown if these suicide risk levels among them were similar or different before the COVID-19 pandemic. Cross-sectional studies conducted on US and Colombian general population during this pandemic reported that the incidence of high suicide risk affected 15% (Fitzpatrick et al., 2020) and 7.6% (Caballero-Domínguez et al., 2020) of the samples, respectively. However, studies regarding college students carried out during this period mostly reported suicidal ideation, rather than suicidal risk, and are often based on a single item (see, e.g., Chen et al., 2020; Pramukti et al., 2020; Tasnim et al., 2020; Wang et al., 2020), which provides inaccurate and sketchy information. For example, suicidal ideation was reported to affect 7.2% of Chinese college students (Chen et al., 2020) and 18.04% of US college students (Wang et al., 2020). These percentages are substantially lower than suicidal risk levels worthy of consideration as found in our study. Nevertheless, studies lack in longitudinal suicidal risk assessments in college students during quarantines due to the COVID-19 pandemic, which impedes further comparisons.

As expected, suicidal behavior history is a meaningful factor to account for when analyzing variability in suicidal risk during quarantines. Suicidal risk levels showed a gradient, with the highest levels affecting the group having suicide attempt history, followed by those with suicidal ideation history, and the lowest levels in those without suicidal behavior history. On the other hand, the findings partially support our second hypothesis, since impulsiveness and mental disorder history were found related to increasing suicidal risk in the entire sample, but the remaining factors expected to be related to suicidal risk (i.e., sex, age, quarantine duration, and loneliness) were not meaningful.

Suicidal risk diminished from the first measurement to the follow up. Based on effect sizes, strikingly, this decrease was strongest in college students having suicide attempt history, followed by those having suicidal ideation history, while it was weakest in those without suicidal behavior background. These findings suggest that under quarantine conditions,

suicidal risk should be monitored not only in college students having pre-existing vulnerabilities, but also in those without such vulnerabilities. Similarly, a Canadian longitudinal study demonstrated that college students without pre-existing mental health concerns were more likely to show declining mental health than those having such pre-existing concerns (Hamza et al., 2020).

Our results suggest that having mental disorder history predicted higher suicide risk. This effect was large in the group with suicide attempt history, which is consistent with evidences indicating that suicidal risk and behaviors, and mental disorders are strongly related (Brådvik, 2018; Knock et al., 2009). However, the effect of having a mental disorder history on suicidal risk was strongest in the group without suicidal behavior history compared to those having suicidal ideation history. Despite that particular diagnoses were not assessed during our study, these findings add hints to suspect that some mental disorders, although positively predicting suicidal risk, would not be related to prior suicidal behaviors. In this regard, a meta-analysis based on longitudinal studies demonstrated that not all mental disorders, but only affective disorders, are meaningful predictors of suicide attempt in young people (Gili et al., 2019).

In our study, NEGURG has the largest positive effects on suicidal risk. Consistently with what was hypothesized, these effects remained stable over time. These findings indicate that NEGURG is the impulsivity trait most strongly predicting suicidal risk in college students during massive quarantines, but it does not allow to distinguish between those who have suicidal behavior history (attempt or ideation) and those who do not. This is contrary to what was reported in a non-pandemic context by Klonsky and May (2010), who found that NEGURG differentiated college students having histories of either suicidal ideations or attempts from those who had never been suicidal. These authors also reported that attempters exhibited higher PREMED levels than both ideators-only and those who had never been suicidal. In our study, the PREMED revealed as having a large positive effect on suicidal risk among those having suicide attempt history; however, this effect would be unsteady, since it emerged only during the follow up.

In college students having suicidal ideation history, besides the NEGURG trait, the lack of both PREMED and PERSEV increased suicidal risk, but these effects were small to medium and unstable during quarantine. The PERSEV effect on suicidal risk, revealed as meaningful only during the follow up, may be related to quarantine, college closures, and classes that transitioned to online throughout 2020. In this regard, boredom – a key aspect of the PERSEV impulsivity trait – was described to have negative impacts on the emotional and social life of college students during the worldwide lockdown and transition to online learning due to the COVID-19 pandemic (Aristovnik et al., 2020).

In those without suicidal behavior history, besides NEGURG, all the remaining impulsivity-related traits exhibited meaningful albeit small to medium effects on suicidal risk. Most of these effects increased suicidal risk, except SENSEEK, which had a sustained protective effect upon it during the quarantine. A similar diminishing influence of SENSEEK on suicidal risk was found in Argentinean college students prior to the COVID-19 pandemic (López Steinmetz et al., 2020) suggesting that this effect would not be due to quarantine or the pandemic. However, in non-pandemic contexts it was reported that SENSEEK increases suicidal risk in high school (Lee et al., 2016; Ortin et al., 2012) and college students (Dvorak et al., 2013) from developed countries. Therefore, the role that SENSEEK has on suicidal risk remains unclear and examining differences among developed and developing regions may be a relevant research opportunity.

This study has some limitations. First, a convenience sampling may not be representative of all college students. Second, women participation prevailed. Nevertheless, this does not necessarily mean a bias inherent to our study, since it was demonstrated that low participation rates only marginally affect the results (Galea & Tracy, 2007). Third, suicide risk measurements were online-based and self-assessed rather than being clinically diagnosed. However, large scale clinical interviews were not achievable under the restrictive quarantine conditions because it would have meant a risky contagion exposure for both participants and interviewers. Fourth, since some suicidal risk differences were found between participants that completed both measurements and those that only completed the first measurement, this may be a potential bias of our study. On the other

hand, this study has important strengths, such as using a longitudinal design that assessed within-person changes across different quarantine durations with a large sample including students from all over the country. Also, we adjusted for pandemic-related variables (quarantine duration and loneliness), main socio-demographic variables, but also personality-related variables (i.e., impulsivity-related traits). Besides, we included baseline data prior to quarantine. However, no data prior to the COVID-19 pandemic were available in our country, which should be accounted as a limitation beyond our study.

Suicide risk is widely affecting college students during lengthy quarantines due to the COVID-19 pandemic. Studies tracking suicide risk changes in this group are needed during college closures and after they recommence. Education on managing negative emotions may help decrease suicide risk in college students during the COVID-19 pandemic.

#### **Declaration of interests**

None.

#### **Data availability statement**

The data that support the findings of this study and the reproducible R code for data analysis are available in the *Open Science Framework* (OSF) repository, <https://doi.org/10.17605/OSF.IO/WCQPA>

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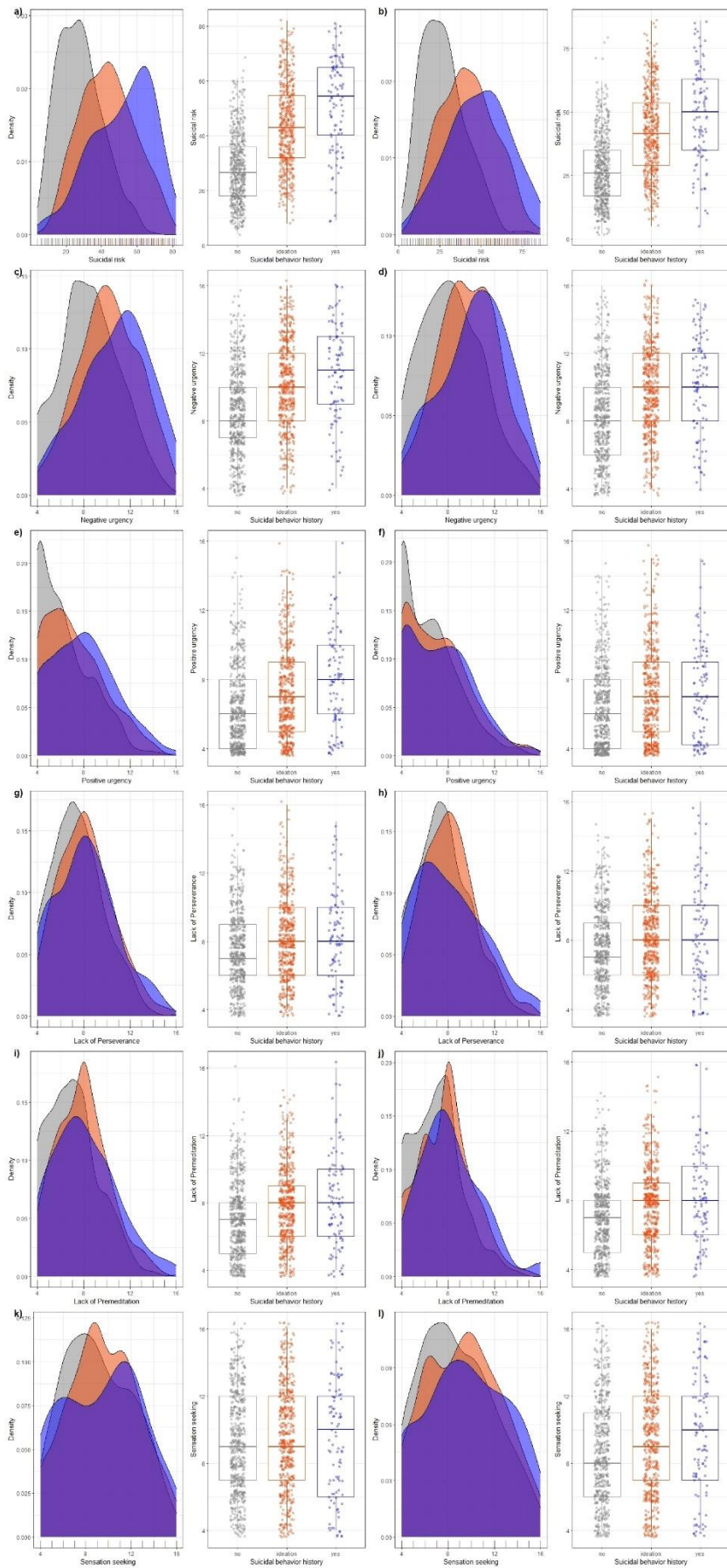
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## Figure caption

**Figure 1.** Distributions of suicidal risk and impulsivity-related traits scores in young college students grouped by suicidal behavior history. Left panels show distributions and measures during the first measurement, while right panels show distributions and measures during the follow up. **a)** Suicidal risk scores during the first measurement. **b)** Suicidal risk scores during the follow up. **c)** Negative urgency scores during the first measurement. **d)** Negative urgency scores during the follow up. **e)** Positive urgency scores during the first measurement. **f)** Positive urgency scores during the follow up. **g)** Lack of perseverance scores during the first measurement. **h)** Lack of perseverance scores during the follow up. **i)** Lack of premeditation scores during the first measurement. **j)** Lack of premeditation scores during the follow up. **k)** Sensation seeking scores during the first measurement. **l)** Sensation seeking scores during the follow up. *Note:* No = Without suicidal behavior history (gray shading); Ideation = Suicidal ideation history (orange shading); Yes = Suicide attempt history (blue shading).

**Table 1.** Description of the sample (N = 1202)

<b>Variable</b>	<b>Categories</b>	<b>n (%)</b>
Suicidal behavior history	Without suicidal behavior history	586 (48.75)
	Suicidal ideation history	518 (43.09)
	Suicide attempt history	98 (8.15)
Sex	Man	173 (14.39)
	Woman	1029 (85.61)
Age	18-21	610 (50.75)
	22-25	592 (49.25)
Quarantine duration	0-days duration	131 (10.90)
	10-days duration	611 (50.83)
	50-days duration	213 (17.72)
	103-days duration	247 (20.55)
Mental disorder history	Absence	900 (74.87)
	Presence	302 (25.13)
Loneliness	Accompanied	1101 (91.60)
	Alone	101 (8.40)



**Table 2.** Differences in mean scores of suicidal risk and impulsivity-related traits during the first measurement and the follow up in young college students

Group	Variable	t(df)	p <sup>a</sup>	M <sub>diff</sub>	95% CI		Mean (SD)	
					Lower	Upper	Time 1	Time 2
Entire sample (N = 1202)	Suicidal risk	5.29 (1201)	< <b>.001</b>	1.34	0.84	1.84	36.60 (16.76)	35.26 (17.39)
	Negative urgency	4.78 (1201)	< <b>.001</b>	0.30	0.18	0.42	9.42 (2.78)	9.12 (2.79)
	Positive urgency	0.81 (1201)	.42	0.05	-0.07	0.17	6.87 (2.51)	6.82 (2.57)
	(Lack of) Perseverance	-1.01 (1201)	.31	-0.05	-0.16	0.05	7.85 (2.37)	7.90 (2.41)
	(Lack of) Premeditation	0.94 (1201)	.35	0.05	-0.05	0.15	7.50 (2.33)	7.45 (2.30)
	Sensation seeking	4.16 (1201)	< <b>.001</b>	0.24	0.12	0.35	9.35 (3.08)	9.11 (3.20)
Without suicidal behavior history (n = 586)	Suicidal risk	2.53 (585)	<b>.01</b>	0.79	0.18	1.41	27.87 (12.60)	27.08 (13.56)
	Negative urgency	2.39 (585)	<b>.02</b>	0.21	0.04	0.38	8.56 (2.58)	8.35 (2.70)
	Positive urgency	-1.14 (585)	.25	-0.09	-0.25	0.07	6.37 (2.29)	6.47 (2.37)
	(Lack of) Perseverance	-1.52 (585)	.13	-0.10	-0.24	0.03	7.51 (2.23)	7.62 (2.30)
	(Lack of) Premeditation	0.84 (585)	.40	0.06	-0.08	0.20	7.08 (2.23)	7.02 (2.15)
	Sensation seeking	4.11 (585)	< <b>.001</b>	0.33	0.17	0.48	9.15 (3.04)	8.83 (3.12)

Suicidal ideation history (n = 518)	Suicidal risk	3.91 (517)	< <b>.001</b>	1.61	0.80	2.42	43.57 (15.40)	41.96 (16.52)
	Negative urgency	3.68 (517)	< <b>.001</b>	0.36	0.17	0.55	10.15 (2.66)	9.79 (2.64)
	Positive urgency	0.98 (517)	.33	0.10	-0.10	0.30	7.24 (2.58)	7.14 (2.68)
	(Lack of) Perseverance	-0.16 (517)	.87	-0.01	-0.18	0.15	8.17 (2.41)	8.18 (2.37)
	(Lack of) Premeditation	0.82 (517)	.41	0.07	-0.10	0.24	7.87 (2.27)	7.80 (2.31)
	Sensation seeking	2.29 (517)	<b>.02</b>	0.20	0.03	0.38	9.55 (3.03)	9.35 (3.20)
Suicide attempt history (n = 98)	Suicidal risk	2.77 (97)	<b>.01</b>	3.14	0.89	5.39	51.96 (17.23)	48.82 (18.73)
	Negative urgency	2.30 (97)	<b>.02</b>	0.53	0.07	0.99	10.76 (2.97)	10.23 (2.90)
	Positive urgency	2.73 (97)	<b>.01</b>	0.64	0.17	1.11	7.86 (2.81)	7.21 (2.77)
	(Lack of) Perseverance	0.13 (97)	.90	0.03	-0.45	0.51	8.16 (2.66)	8.13 (3.01)
	(Lack of) Premeditation	-0.55 (97)	.58	-0.11	-0.52	0.29	8.09 (2.78)	8.20 (2.67)
	Sensation seeking	-0.68 (97)	.50	-0.13	-0.52	0.25	9.44 (3.49)	9.57 (3.55)

*Note:*  $t_{(df)}$ : Paired Student's t-Test (degrees of freedom) with alternative hypothesis two-sided.  $M_{diff}$ : Mean of the differences. 95% CI: 95% Confidence Intervals. SD: Standard deviation. Time 1: First measurement. Time 2: Second measurement or follow up.

<sup>a</sup> Exact p-values are informed, except for p-values under .001, which are informed as < .001. Statistically significant p-values are highlighted in bold.

**Table 3.** Model best fitting suicidal risk in young college students (N = 1202) considering impulsivity-related traits scores as measured at a) the first measurement and b) the follow up

	Predictors	<i>b</i>	<i>t</i> <sub>(df)</sub>	<i>p</i> <sup>a</sup>	95% CI	
					Lower	Upper
<b>a)</b>	Intercept	9.50	2.15 (1201)	<b>.03</b>	0.85	18.15
	Time (2 <sup>nd</sup> )	-1.34	-5.28 (1201)	<b>&lt; .001</b>	-1.84	-0.84
	Sex	-0.85	-0.82 (1187)	.41	-2.86	1.17
	Age	-1.20	-1.70 (1187)	.09	-2.58	0.18
	Quarantine duration: baseline vs 10-days	1.12	0.96 (1187)	.34	-1.17	3.41
	Quarantine duration: baseline vs 50-days	2.14	1.59 (1187)	.11	-0.50	4.78
	Quarantine duration: baseline vs 103-days	0.59	0.45 (1187)	.65	-1.98	3.15
	Mental disorder history	4.13	4.77 (1187)	<b>&lt; .001</b>	2.43	5.82
	Loneliness	-0.14	-0.11 (1187)	.91	-2.62	2.33
	Negative urgency	2.27	15.20 (1187)	<b>&lt; .001</b>	1.98	2.56
	Positive urgency	0.30	1.84 (1187)	.07	-0.02	0.62
	(Lack of) Perseverance	0.48	2.94 (1187)	<b>.003</b>	0.16	0.80
	(Lack of) Premeditation	0.74	4.23 (1187)	<b>&lt; .001</b>	0.40	1.09
	Sensation seeking	-0.41	-3.41 (1187)	<b>.001</b>	-0.65	-0.18
<b>b)</b>	Intercept	6.78	1.52 (1201)	0.13	-1.95	15.51
	Time (2 <sup>nd</sup> )	-1.34	-5.28 (1201)	<b>&lt; .001</b>	-1.84	-0.84
	Sex	-0.96	-0.95 (1187)	.34	-2.93	1.01

Age	-0.63	-0.92 <sub>(1187)</sub>	.36	-1.99	0.72
Quarantine duration: baseline vs 10-days	1.35	1.18 <sub>(1187)</sub>	.24	-0.88	3.59
Quarantine duration: baseline vs 50-days	2.06	1.56 <sub>(1187)</sub>	.12	-0.52	4.64
Quarantine duration: baseline vs 103-days	1.55	1.21 <sub>(1187)</sub>	.23	-0.93	4.05
Mental disorder history	4.80	5.69 <sub>(1187)</sub>	<b>&lt; .001</b>	3.15	6.45
Loneliness	1.35	1.09 <sub>(1187)</sub>	.28	-1.07	3.77
Negative urgency	2.43	16.52 <sub>(1187)</sub>	<b>&lt; .001</b>	2.14	2.72
Positive urgency	0.15	0.95 <sub>(1187)</sub>	.34	-0.16	0.47
(Lack of) Perseverance	0.60	3.86 <sub>(1187)</sub>	<b>&lt; .001</b>	0.30	0.91
(Lack of) Premeditation	0.72	4.09 <sub>(1187)</sub>	<b>&lt; .001</b>	0.37	1.06
Sensation seeking	-0.39	-3.40 <sub>(1187)</sub>	<b>.001</b>	-0.62	-0.17

*Note:* 95% CI: 95% Confidence Intervals.

<sup>a</sup> Exact p-values are informed, except for p-values under .001, which are informed as < .001. Statistically significant p-values are highlighted in bold.

**Table 4.** Models best fitting suicidal risk, considering impulsivity-related traits as measured at the first measurement, in young college students grouped by suicidal behavior history

Group	Predictors	<i>b</i>	<i>t</i> <sub>(df)</sub>	<i>p</i> <sup>a</sup>	95% CI	
					Lower	Upper
Without suicidal behavior history (n = 586)	Intercept	-0.16	-0.05 (585)	.96	-6.91	6.58
	Time (2 <sup>nd</sup> )	-0.79	-2.51 (585)	<b>.01</b>	-1.41	-0.18
	Sex	-1.10	-0.91 (573)	.36	-3.47	1.27
	Age	-0.93	-1.07 (573)	.29	-2.64	0.77
	Quarantine duration: baseline vs 10-days	1.32	0.90 (573)	.37	-1.55	4.20
	Quarantine duration: baseline vs 50-days	0.94	0.55 (573)	.58	-2.40	4.29
	Quarantine duration: baseline vs 103-days	0.73	0.45 (573)	.65	-2.41	3.87
	Mental disorder history	4.44	3.47 (573)	<b>.001</b>	1.94	6.93
	Loneliness	0.16	0.10 (573)	.92	-3.09	3.42
	Negative urgency	2.10	10.88 (573)	<b>&lt; .001</b>	1.72	2.47
Positive urgency	0.76	3.37 (573)	<b>.001</b>	0.32	1.20	

	(Lack of) Perseverance	0.74	3.47 <sub>(573)</sub>	<b>.001</b>	0.32	1.16
	(Lack of) Premeditation	0.49	2.16 <sub>(573)</sub>	<b>.03</b>	0.05	0.93
	Sensation seeking	-0.45	-2.97 <sub>(573)</sub>	<b>.003</b>	-0.75	-0.15
Suicidal ideation history (n = 518)	Intercept	11.38	2.32 <sub>(517)</sub>	<b>.02</b>	1.83	20.94
	Time (2 <sup>nd</sup> )	-1.61	-3.88 <sub>(517)</sub>	<b>&lt; .001</b>	-2.42	-0.80
	Sex	0.19	0.10 <sub>(505)</sub>	.92	-3.41	3.78
	Age	-1.41	-1.17 <sub>(505)</sub>	.24	-3.77	0.95
	Quarantine duration: baseline vs 10-days	2.37	1.20 <sub>(505)</sub>	.23	-1.50	6.24
	Quarantine duration: baseline vs 50-days	4.34	1.88 <sub>(505)</sub>	.06	-0.16	8.84
	Quarantine duration: baseline vs 103-days	2.80	1.23 <sub>(505)</sub>	.22	-1.64	7.24
	Mental disorder history	2.68	2.05 <sub>(505)</sub>	<b>.04</b>	0.12	5.23
	Loneliness	-0.31	-0.15 <sub>(505)</sub>	.88	-4.43	3.81
	Negative urgency	2.17	8.77 <sub>(505)</sub>	<b>&lt; .001</b>	1.68	2.65
	Positive urgency	0.06	0.22 <sub>(505)</sub>	.82	-0.44	0.56

	(Lack of) Perseverance	0.46	1.66 <sub>(505)</sub>	.10	-0.08	1.00
	(Lack of) Premeditation	0.92	3.05 <sub>(505)</sub>	<b>.002</b>	0.33	1.52
	Sensation seeking	-0.40	-1.87 <sub>(505)</sub>	.06	-0.81	0.02
Suicide attempt history (n = 98)	Intercept	25.10	2.74 <sub>(97)</sub>	<b>.017</b>	7.61	42.59
	Time (2 <sup>nd</sup> )	-3.14	-2.68 <sub>(97)</sub>	<b>.01</b>	-5.38	-0.90
	Sex	-3.95	-0.80 <sub>(85)</sub>	.42	-13.36	5.45
	Age	-1.49	-0.55 <sub>(85)</sub>	.58	-6.68	3.70
	Quarantine duration: baseline vs 10-days	-5.48	-1.36 <sub>(85)</sub>	.18	-13.17	2.21
	Quarantine duration: baseline vs 50-days	-2.51	-0.56 <sub>(85)</sub>	.58	-11.08	6.07
	Quarantine duration: baseline vs 103-days	-11.24	-2.28 <sub>(85)</sub>	<b>.02</b>	-20.70	-1.78
	Mental disorder history	10.21	3.34 <sub>(85)</sub>	<b>.001</b>	4.36	16.06
	Loneliness	-2.70	-0.66 <sub>(85)</sub>	.51	-10.52	5.13
	Negative urgency	3.05	4.97 <sub>(85)</sub>	<b>&lt; .001</b>	1.88	4.23
Positive urgency	-0.13	-0.22 <sub>(85)</sub>	.83	-1.27	1.01	

(Lack of) Perseverance	-0.36	<b>-0.68</b> <sub>(85)</sub>	.50	<b>-1.38</b>	0.66
(Lack of) Premeditation	0.89	<b>1.54</b> <sub>(85)</sub>	.13	-0.22	2.00
Sensation seeking	-0.51	<b>-1.14</b> <sub>(85)</sub>	.26	<b>-1.37</b>	0.35

*Note:* 95% CI: 95% Confidence Intervals.

<sup>a</sup> Exact p-values are informed, except for p-values under .001, which are informed as < .001. Statistically significant p-values are highlighted in bold.



**Table 5.** Models best fitting suicidal risk, considering impulsivity-related traits as measured at the follow up, in young college students grouped by suicidal behavior history

Group	Predictors	<i>b</i>	<i>t</i> <sub>(df)</sub>	<i>p</i> <sup>a</sup>	95% CI	
					Lower	Upper
Without suicidal behavior history (n = 586)	Intercept	-2.43	-0.72 (585)	.47	-9.01	4.14
	Time (2 <sup>nd</sup> )	-0.79	-2.51 (585)	<b>.01</b>	-1.41	-0.18
	Sex	-1.31	-1.11 (573)	.27	-3.64	1.01
	Age	-0.08	-0.10 (573)	.92	-1.74	1.58
	Quarantine duration: baseline vs 10-days	1.92	1.33 (573)	.18	-0.89	4.74
	Quarantine duration: baseline vs 50-days	1.32	0.78 (573)	.43	-1.96	4.59
	Quarantine duration: baseline vs 103-days	1.83	1.17 (573)	.24	-1.22	4.89
	Mental disorder history	4.48	3.61 (573)	<b>&lt; .001</b>	2.06	6.90
	Loneliness	2.17	1.33 (573)	.18	-1.02	5.37
	Negative urgency	2.33	12.79 (573)	<b>&lt; .001</b>	1.97	2.68
	Positive urgency	0.49	2.23 (573)	.03	0.06	0.91

Suicidal ideation history (n = 518)	(Lack of) Perseverance	0.75	3.76 <sub>(573)</sub>	<b>&lt; .001</b>	0.36	1.14
	(Lack of) Premeditation	0.35	1.56 <sub>(573)</sub>	.12	-0.09	0.79
	Sensation seeking	-0.40	-2.76 <sub>(573)</sub>	<b>.01</b>	-0.68	-0.12
	Intercept	9.32	2.03 <sub>(517)</sub>	<b>.04</b>	0.35	18.30
	Time (2 <sup>nd</sup> )	-1.61	-3.88 <sub>(517)</sub>	<b>&lt; .001</b>	-2.42	-0.80
	Sex	0.25	0.14 <sub>(505)</sub>	.89	-3.27	3.78
	Age	-1.29	-1.08 <sub>(505)</sub>	.28	-3.61	1.04
	Quarantine duration: baseline vs 10-days	1.33	0.68 <sub>(505)</sub>	.50	-2.48	5.13
	Quarantine duration: baseline vs 50-days	2.89	1.27 <sub>(505)</sub>	.20	-1.55	7.32
	Quarantine duration: baseline vs 103-days	2.44	1.09 <sub>(505)</sub>	.28	-1.93	6.80
	Mental disorder history	3.55	2.74 <sub>(505)</sub>	<b>.01</b>	1.03	6.07
	Loneliness	1.00	0.48 <sub>(505)</sub>	.63	-3.04	5.03
	Negative urgency	2.46	9.46 <sub>(505)</sub>	<b>&lt; .001</b>	1.95	2.96
	Positive urgency	0.05	0.19 <sub>(505)</sub>	.85	-0.47	0.57

	(Lack of) Perseverance	0.68	2.44 <sub>(505)</sub>	<b>.01</b>	0.14	1.23
	(Lack of) Premeditation	0.59	1.94 <sub>(505)</sub>	.05	-0.004	1.18
	Sensation seeking	-0.38	-1.91 <sub>(505)</sub>	.06	-0.77	0.007
Suicide attempt history (n = 98)	Intercept	13.32	1.58 <sub>(97)</sub>	.12	-2.82	29.45
	Time (2 <sup>nd</sup> )	-3.14	-2.68 <sub>(97)</sub>	<b>.01</b>	-5.38	-0.90
	Sex	-0.67	-0.15 <sub>(85)</sub>	.88	-9.28	7.94
	Age	-1.12	-0.44 <sub>(85)</sub>	.66	-6.05	3.80
	Quarantine duration: baseline vs 10-days	-3.63	-0.95 <sub>(85)</sub>	.35	-10.97	3.71
	Quarantine duration: baseline vs 50-days	0.13	0.03 <sub>(85)</sub>	.98	-7.95	8.21
	Quarantine duration: baseline vs 103-days	-7.09	-1.52 <sub>(85)</sub>	.13	-16.03	1.85
	Mental disorder history	12.30	4.44 <sub>(85)</sub>	<b>&lt; .001</b>	6.99	17.61
	Loneliness	-2.97	-0.74 <sub>(85)</sub>	.46	-10.65	4.70
	Negative urgency	2.38	4.57 <sub>(85)</sub>	<b>&lt; .001</b>	1.38	3.38
Positive urgency	0.26	0.48 <sub>(85)</sub>	.63	-0.78	1.30	

(Lack of) Perseverance	-0.17	-0.38 <sub>(85)</sub>	.70	-1.06	0.71
(Lack of) Premeditation	2.29	4.29 <sub>(85)</sub>	<b>&lt; .001</b>	1.27	3.31
Sensation seeking	-0.73	-1.83 <sub>(85)</sub>	.07	-1.50	0.03

*Note:* 95% CI: 95% Confidence Intervals.

<sup>a</sup> Exact p-values are informed, except for p-values under .001, which are informed as < .001. Statistically significant p-values are highlighted in bold.

## Supplementary materials for:

### Suicidal risk and impulsivity-related traits among young Argentinean college students during a quarantine of up to 103-days duration: Longitudinal evidence from the COVID-19 pandemic

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<b>Table S1.</b> Differences in suicidal risk scores at time 1, comparing college students who completed the survey for the two-repeated measurements (n = 1202) and those who only completed the survey for the first measurement (n = 832)						
Sample or group	t (df)	p-value <sup>a</sup>	95% CI		Mean scores of suicidal risk at time 1 <sup>b</sup>	
			Lower	Upper	Participants answering the two-repeated measurements	Participants answering only the 1 <sup>st</sup> measurement
Entire sample	4.42 (1883.6)	<b>&lt; .001</b>	1.76	4.58	36.60	33.43
Group without suicidal behavior history	0.98 (1004.2)	.32	-0.75	2.26	27.87	27.12
Group with suicide ideation history	2.41 (698.33)	<b>.02</b>	0.48	4.70	43.57	40.98
Group with suicide attempt history	2.79 (92.39)	<b>.006</b>	2.40	14.22	51.96	43.65

Notes: 95% CI: 95% Confidence Intervals.  
<sup>a</sup> Exact p-values are informed, except for p-values under .001, which are informed as < .001. Statistically significant p-values are highlighted in bold.  
<sup>b</sup> The attrition from the first to the second measurement was 40.90%.

<b>Table S2. Skewness and kurtosis in the entire sample (N = 1202)</b>		
<b>Variable</b>	<b>Skewness<sup>a</sup></b>	<b>Kurtosis<sup>b</sup></b>
Suicidal risk – Time 1	0.40	2.45
Suicidal risk – Time 2	0.46	2.58
Negative urgency – Time 1	0.08	2.40
Positive urgency – Time 1	0.79	2.99
(Lack of) Perseverance – Time 1	0.48	2.95
(Lack of) Premeditation – Time 1	0.53	3.00
Sensation seeking – Time 1	0.14	2.17
Negative urgency – Time 2	0.13	2.35
Positive urgency – Time 2	0.83	3.22
(Lack of) Perseverance – Time 2	0.47	2.89
(Lack of) Premeditation – Time 2	0.52	3.15
Sensation seeking – Time 2	0.21	2.15
<sup>a</sup> Range of acceptable values for skewness: -1 to 1 (Brown, 2006).		
<sup>b</sup> Range of acceptable values for kurtosis: -3 to 3 (Brown, 2006).		

**Table S3.** Multicollinearity assessment by using the variance inflation factor (VIF), the tolerance statistics, and the mean VIF<sup>a</sup> for suicidal risk (outcome) in young college students (N = 1202)

<b>Model</b>	<b>Predictors</b>	<b>VIF</b>	<b>Tolerance</b>	<b>Mean VIF</b>
Suicidal risk considering impulsivity-related traits measured during the first time	Sex	1.07	0.93	1.18
	Age	1.03	0.97	
	Quarantine duration	1.01	0.99	
	Mental disorder history	1.05	0.95	
	Loneliness	1.02	0.98	
	Negative urgency	1.37	0.73	
	Positive urgency	1.41	0.71	
	Lack of perseverance	1.23	0.81	
	Lack of premeditation	1.40	0.72	
	Sensation seeking	1.16	0.86	
Suicidal risk considering impulsivity-related traits measured during the follow up	Sex	1.07	0.93	1.19
	Age	1.04	0.96	
	Quarantine duration	1.01	0.99	
	Mental disorder history	1.04	0.96	
	Loneliness	1.02	0.98	
	Negative urgency	1.41	0.71	
	Positive urgency	1.51	0.66	
	Lack of perseverance	1.23	0.81	
	Lack of premeditation	1.41	0.71	
	Sensation seeking	1.18	0.85	

<sup>a</sup> We calculated the VIF, the tolerance statistics, and the mean VIF by using the *VIF* function from the *car* package of R. We adopted the following criteria for acceptable values: VIF < 10; tolerance > 0.2; mean VIF not substantially greater than 1 (Field et al., 2012).



**Table S4.** Percentages of young college students with low, moderate, and high suicidal risk in groups of suicidal behavior history and in the entire sample, during the first and the second measurement

<b>Time</b>	<b>Suicidal risk levels</b>	<b>Without suicidal behavior background (n = 586)</b>	<b>Suicidal ideation history (n = 518)</b>	<b>Suicide attempt history (n = 98)</b>	<b>Entire sample (N = 1202)</b>
First measurement	Low suicidal risk	58.36	19.30	12.24	37.77
	Moderate suicidal risk	30.37	34.56	21.43	31.45
	High suicidal risk	11.26	46.14	66.33	30.78
Second measurement	Low suicidal risk	61.26	25.87	16.33	42.35
	Moderate suicidal risk	26.79	31.47	27.55	28.87
	High suicidal risk	11.94	42.66	56.12	28.78

*Note:* Suicidal risk as measured by the Inventory of Suicide Orientation (ISO-30; King & Kowalchuk, 1994), in its Argentinean validation (Fernández Liporace & Casullo, 2006). Cutoff scores: Raw scores < 30 indicate *low suicidal risk*, raw scores between 30-44 indicate *moderate risk*, and raw scores ≥ 45 indicate *high risk* (King & Kowalchuk, 1994).