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Nonsuicidal self-injury behavior and internet use profile in undergraduate students: a cross-sectional study

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This is a preliminary, unedited version of a manuscript that has been accepted for publication in Trends in Psychiatry and Psychotherapy. As a service to our readers, we are providing this early version of the manuscript. The manuscript will still undergo copyediting, typesetting, and review of the resulting proof before it is published in final form on the SciELO database (www.scielo.br/trends). The final version may present slight differences in relation to the present version.

Nonsuicidal self-injury behavior and internet use profile in undergraduate students: a cross-sectional study

Short Title: Nonsuicidal self-injury behavior and internet use

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ABSTRACT

Objective: The objective of the present study was to describe and analyze the characteristics of internet use in undergraduate students that engaged in nonsuicidal self-injury (NSSI) compared with individuals not engaging in this behavior.

Methods: An observational cross-sectional study was conducted. The questionnaire used to investigate NSSI was devised based on the DSM5 diagnostic criteria. Internet use was investigated using 2 questionnaires: a questionnaire developed by the researchers; and the Portuguese version of the Internet Addiction Test (IAT). Exploratory analysis of data was performed based on summary measures. Mann-Whitney and chi-square tests were employed, and multiple logistic regression models constructed with stepwise variable selection criteria. A 5% level of significance was adopted.

Results: Data on 6,906 university students were analyzed, 1,188 (17%) of whom reported at least one NSSI episode in their lifetime. The group engaging in self-injurious behavior showed a stronger association with more intense internet use than they would like and felt they related more with individuals online than in person. The group engaging in self-injurious behavior reported using the internet more often to meet new people for friendships and for erotic relationships and preferred the excitement of the internet to intimacy with a partner.
Conclusion: The feeling of loneliness linked to self-injurious behavior might contribute to self-injurers seeking relationships online. Also, the anonymous nature of online interactions may constitute an attractive environment for expressing psychological anguish and other emotional problems. As a study limitation, this is a cross-sectional design in which associations are identified, but risk factors cannot be established.
Keywords: Self-injury, internet use, adolescents, students.

1. INTRODUCTION

Nonsuicidal self-injurious behavior (NSSI) can be defined as direct damage to body tissue without apparent suicidal intent[1,2]. Self-injurious behavior is associated with greater risk of suicidal ideation and attempted suicide[3], even when compared to anxiety, depression and personality disorders analyzed separately[4]. In the past decade, rates of NSSI among adolescents have risen, with peak incidence occurring at 14-15 years[5,6], coinciding with the immersion of this group in the virtual online world.

Adolescents and young adults comprise the main population involved in NSSI behavior and engaged in online activity[7-9], and use the internet for a variety of purposes, ranging from academic use to personal relationships. In the USA, 89% of young individuals aged 13-17 years own a smartphone and 70% use social media platforms several times a day[10]. In the UK, the Office of Communications[11] stated that 83% of children aged 12-15 have a smartphone and 99% are online for

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almost 21 hours per week[12].

The effect of the use of internet and social media networks on the mental health of this population has been a focus of research interest, with study results showing that excessive use of or dependence on the internet contributes to physical and emotional symptoms, such as increased levels of anxiety, depression and loneliness[13], and is also associated with suicidal behavior[14].

With regard to NSSI, a systematic review conducted by Marchant *et al.* found a greater association of behavior with pathological use of or addiction to the internet and social media platforms[15]. The International Society for the Study of Self-injury (ISSS) recognizes the emergence of self-injurious behavior on the internet and the importance of further investigations in this area[16], while NSSI is a recurrent theme featuring in online search tools and shared content via the major social media platforms[17].

Elucidating the characteristics of internet use among university students that engage in NSSI behavior, including time spent online and activities pursued during use, can help inform the management of cases treated in clinical practice, and shape public policies for preventing this behavior and its associated risks. The present study adds to this discussion, analyzing the profile of internet use of undergraduate students engaging in NSSI behavior and investigating the preferred use of the internet among this population.

2. METHODS

An observational cross-sectional study was conducted. The study project and free and informed consent form were approved on 01/02/2017 by the Research Ethics Committee of the Unicamp School of Medical Science under permit no

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1.903.287 (CAAE 62765316.6.0000.5404).

2.1. Participants

A total of 6,906 undergraduate students enrolled at the State University of Campinas (UNICAMP), São Paulo state, Brazil, participated in the study. The university had approximately 20,000 undergraduate students at the time of data collection. Students from all areas of study (exact sciences, arts, humanities, health sciences, and biological sciences), enrolled in full-time, morning, or evening programs, and from all campuses were eligible to participate.

Data were collected in classrooms whose professors authorized the administration of the questionnaires, and all students present on the day of data collection were invited to participate. Participation was voluntary, and the study therefore used a non-probabilistic convenience sampling strategy. Although the final sample reached around 40% of the undergraduate population, participation depended on classroom accessibility and student availability, and thus the sample cannot be considered representative of the entire student body. Students who felt uncomfortable answering the questionnaire or reported insufficient proficiency in Portuguese were excluded from the study.

2.2. Procedures

Students were invited to take part in the study “The UNICAMP student: sociodemographic and cultural profile, personal and social identity, spirituality, quality of life, use of alcohol and other psychoactive substances, physical and mental health”. The study commenced in 2016 and involved researchers and teachers from different areas of the UNICAMP, namely: medicine, economy, demography, music, among others. Initially, meetings were held on a weekly basis,

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with the aim of devising the project and questionnaire to be applied to students.

A paper and pencil questionnaire (hardcopy) was applied through face-to-face interviews held during the 2 semesters of 2017 up to the end of the 1st semester of 2018. All interview sessions were overseen by members of the research team and by undergraduates involved in the science initiation project. The conducting of the study and applying of the questionnaire had the support of the Central Committee for Undergraduate studies and of the Dean´s Office for Undergraduate education of the university. The schedule for applying the questionnaire was arranged after agreement by the lecturers of the different subjects taught, who were invited to take in the study by e-mail and subsequently set aside a time during their class for survey completion.

2.3. Measurements

The questionnaire collected information on sociodemographic, political, religious and cultural aspects, and included questions on mental health and quality of life. Sociodemographic profile was determined by the socioeconomic level questionnaire (Brazil Economic Classification Criteria – 2015) of the Brazilian Association of Research Companies (ABEP). Other analyses using the same database have already been conducted and are available in the form of scientific articles. Regarding self-injury, the study by da Silva Bandeira et al. (2022) presents descriptive results of individuals who engage in self-injury, as well as its associations with mental disorders and suicidal behavior, using this same sample[6].

The questionnaire probing “nonsuicidal self-injury” – NSSI – was developed by the researchers based on the criteria defined in DSM 5. The frequency of self-injury was investigated by posing the initial question: “have you ever deliberately cut yourself without the intent to kill yourself?”. If answering “Yes”, the student then

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answered the other questions determining the characteristics of the NSSI, including frequency, function, age at onset and discontinuation, concern over the behavior, and seeking of professional help. In addition to the above questions, the questionnaire applied gave students the opportunity to state how they learned about self-harming.

Internet use was investigated using 2 questionnaires: a questionnaire developed by the researchers; and the Portuguese version of the Internet Addiction Test (IAT). The IAT is a tool for screening internet dependence that has shown valid internal consistency and was translated for use in Brazil in 2012. In the present analysis, NSSI was analyzed using all items of the IAT[18], given the in-depth discussion of the profile of internet use.

The data collected were tabulated in an Excel spreadsheet by graduates involved in the study and by students on scientific initiation programs. As a measure to reduce tabulation errors, spreadsheets were reviewed by 3 different participants. After tabulation and review, the data were treated statistically by creating a database using the statistical package SPSS for Windows (version 22).

Exploratory analysis of the data was carried out using summary measures (mean, standard deviation, minimum, median and maximum). Mann-Whitney´s test (numeric variables) or the chi-square test (categorical variables) was used to compare the NSSI and non-NSSI groups. The association of number of NSSI episodes in the past year with other variables was determined using Spearman´s coefficient of correlation, or the Mann-Whitney or Kruskal-Wallis tests. Multiple logistic regression models with stepwise selection of variables were constructed to identify the group of factors which best explained engagement in NSSI. Multiple linear regression models with stepwise selection of variables were constructed to identify the group of factors which best explained the number of episodes of NSSI

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in the past year. A 5% level of significance was adopted.

3. RESULTS

Data on 6,906 students, aged 15-66 years, were analyzed. The main sociodemographic characteristics for the sample are presented in **Table 1**. Of the 6,906 participants, 1,188 (17%) reported at least one NSSI episode, without the intent to kill themselves. Self-injurers were younger and predominantly female.

Table 1 – Characteristics of study participants (n=6906)

Characteristics	No. (%)
Gender	
Female	3309 (48.1)
Male	3569 (51.6)
Age	
15-20 years	3403 (49.6)
21-24 years	2636 (38.4)
>24 years	836 (12.0)
Skin color/Ethnicity	
White	5020 (73.3)
Brown	1178 (17.2)
Black	388 (5.7)
Indigenous	36 (0.5)
Others	119 (1.7)
Paternal education	
None	31 (0.5)
Basic / Primary incomplete	606 (8.8)
Primary complete / Secondary incomplete	679 (9.9)
Secondary complete / Higher incomplete	2131 (31.1)
Higher complete	2096 (30.6)
Graduate level	1208 (17.6)
Others	103 (1.5)
Maternal education	
None	18 (0.3)
Basic / Primary incomplete	528 (7.3)
Primary complete / Secondary incomplete	588 (8.5)
Secondary complete / Higher incomplete	2082 (30.3)
Higher complete	2279 (33.1)
Graduate level	1358 (19.7)
Others	26 (0.4)
Areas of knowledge	
Arts and Humanities	1924 (27.8)
Basic Sciences	769 (11.1)
Health Sciences	1594 (23.1)
Exact Science and Technology	2317 (33.5)
Vocational	307 (4.4)

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The numeric results comparing the NSSI groups for internet use are presented in **Table 2.** Regarding pattern of internet use, the association of non-NSSI and NSSI groups according to the categorical variables for frequency and characteristics of internet use were assessed. In terms of frequency of use, the NSSI group showed a stronger association with staying online longer than intended; overly anticipating when online again; losing sleep due to being online until late; feeling preoccupied with the internet when off-line, fantasizing about being online; often saying "just a few more minutes" when online; and trying to hide how long spent on online.

Table 2 – Comparison of groups for categorical variables

Variable	Have you ever DELIBERATELY cut, injured or burned yourself ?		*p*-value	% Missing
	No	Yes		
Based on the past 30 days, how often do you use the internet (or any online device) or other device with a screen (including social media, electronic games, online games, but not television or going to the cinema)?:			0.180	4%
1-I do not use these devices, the internet or online equipment	11 (0.20%)	3 (0.25%)		
2-Every, or almost every day, morning, afternoon and night	4434 (81.3%)	972 (82.4%)		
3-Every, or almost every day, but not morning, afternoon and night (one or two periods without using)	644 (11.8%)	123 (10.4%)		
3-Every, or almost every day, but only a few times a day and not for long	323 (5.92%)	66 (5.59%)		
5-Three times or more per week, but not every day	29 (0.53%)	10 (0.85%)		
6-Less than three times per week	11 (0.20%)	6 (0.51%)		
If answering items 2 to 6 above:			**0.001**	17%
1-More intense use than I would like	2334 (49.6%)	574 (55.1%)		
2-At the intensity I like	2253 (47.9%)	434 (41.7%)		
3-Less than I would like	114 (2.43%)	33 (3.17%)		
Meeting new people for friendship:			**0.016**	5%
1-Never	2870 (53.3%)	572 (48.9%)		
2-≤ 1 time/week	1791 (33.3%)	428 (36.6%)		
3-1-3 times/week	456 (8.47%)	93 (7.96%)		
4-3-6 times/week	134 (2.49%)	34 (2.91%)		
5-Every day	133 (2.47%)	42 (3.59%)		
Keeping in touch with friends:			**0.026**	5%
1-Never	345 (6.37%)	54 (4.60%)		

2-≤ 1 time/week	550 (10.2%)	125 (10.6%)
3-1-3 times/week	782 (14.4%)	151 (12.9%)
4-3-6 times/week	788 (14.6%)	156 (13.3%)
5-Every day	2947 (54.5%)	688 (58.6%)

Table 2 (cont.) – Comparison of groups for categorical variables

Variable	Have you ever DELIBERATELY cut, injured or burned yourself ?		*p*-value	% Missing
	No	Yes		
Dating:			0.121	6%
1-Never	2464 (46.3%)	492 (42.7%)		
2-≤ 1 time/week	461 (8.65%)	112 (9.73%)		
3-1-3 times/week	328 (6.16%)	62 (5.39%)		
4-3-6 times/week	268 (5.03%)	60 (5.21%)		
5-Every day	1806 (33.9%)	425 (36.9%)		
Meet people for erotic relationship:			**0.048**	6%
1-Never	4351 (81.1%)	900 (77.7%)		
2-≤ 1 time/week	532 (9.92%)	145 (12.5%)		
3-1-3 times/week	276 (5.15%)	70 (6.04%)		
4-3-6 times/week	104 (1.94%)	25 (2.16%)		
5-Every day	101 (1.88%)	19 (1.64%)		
To have sex:			0.126	5%
1-Never	4429 (82.2%)	920 (79.0%)		
2-≤ 1 time/week	510 (9.47%)	132 (11.3%)		
3-1-3 times/week	249 (4.62%)	63 (5.41%)		
4-3-6 times/week	100 (1.86%)	23 (1.97%)		
5-Every day	98 (1.82%)	27 (2.32%)		
To view erotic content/pornography:			0.051	5%
1-Never	2963 (55.2%)	636 (54.8%)		
2-≤ 1 time/week	879 (16.4%)	229 (19.7%)		
3-1-3 times/week	834 (15.5%)	158 (13.6%)		
4-3-6 times/week	434 (8.09%)	77 (6.63%)		
5-Every day	257 (4.79%)	61 (5.25%)		
To keep in touch with family members:			**0.023**	5%
1-Never	294 (5.45%)	71 (6.07%)		
2-≤ 1 time/week	547 (10.1%)	141 (12.1%)		
3-1-3 times/week	1129 (20.9%)	249 (21.3%)		
4-3-6 times/week	1161 (21.5%)	206 (17.6%)		
5-Every day	2263 (42.0%)	502 (42.9%)		

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Table 2 (cont.) – Comparison of groups for categorical variables

Variable	Have you ever DELIBERATELY cut, injured or burned yourself ?		*p*-value	% Missing
	No	Yes		
Other activity involving relations:			0.479	65%
1-Never	1442 (72.4%)	331 (74.9%)		
2-≤ 1 time/week	40 (2.01%)	7 (1.58%)		
3-1-3 times/week	92 (4.62%)	14 (3.17%)		
4-3-6 times/week	120 (6.02%)	21 (4.75%)		
5-Every day	299 (15.0%)	69 (15.6%)		
In the last 3 months, have you used the internet while driving?			**<0.001**	5%
1-No	3844 (71.1%)	899 (77.2%)		
2-Yes	1565 (28.9%)	266 (22.8%)		
How often?			0.148	74%
1-Only once	204 (13.2%)	45 (16.9%)		
2-More than once, but rarely	724 (46.8%)	133 (49.8%)		
3-Many times	381 (24.6%)	53 (19.9%)		
4-Frequently	237 (15.3%)	36 (13.5%)		
Do you think you relate more with people on the internet than in person ”live”?:			**<0.001**	4%
1-No	3980 (73.2%)	795 (67.7%)		
2-Yes	1457 (26.8%)	379 (32.3%)		
You prefer:			**<0.001**	5%
1- Relationships in person (“live”)	5246 (97.0%)	1093 (94.0%)		
2- Relationships over the internet	164 (3.03%)	70 (6.02%)		

Variable	Have you ever DELIBERATELY cut, injured or burned yourself ?		*p*-value	% Missing
	No	Yes		
How often do you find that you stay online longer than you intended ?			**0.015**	4%
1-Not applicable or never	153 (2.82%)	31 (2.64%)		
2-Rarely	551 (10.1%)	115 (9.80%)		
3-Occasionally	1433 (26.4%)	281 (24.0%)		
4-Frequently	1178 (21.7%)	251 (21.4%)		
5-Often	1163 (21.4%)	235 (20.0%)		
6-Always	957 (17.6%)	260 (22.2%)		
How often do you neglect household chores to spend more time online?			**<0.001**	4%
1-Not applicable or never	368 (6.78%)	76 (6.49%)		
2-Rarely	1212 (22.3%)	237 (20.2%)		
3-Occasionally	1648 (30.4%)	307 (26.2%)		
4-Frequently	1115 (20.5%)	252 (21.5%)		

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5-Often	795 (14.7%)	188 (16.1%)		
6-Always	288 (5.31%)	111 (9.48%)		
How often do you prefer the excitement of the internet to intimacy with your partner?			**0.002**	5%
1-Not applicable or never	3326 (61.9%)	672 (58.1%)		
2-Rarely	1353 (25.2%)	294 (25.4%)		
3-Occasionally	453 (8.44%)	113 (9.77%)		
4-Frequently	139 (2.59%)	39 (3.37%)		
5-Often	59 (1.10%)	19 (1.64%)		
6-Always	40 (0.74%)	20 (1.73%)		
How often do you form new relationships with fellow online users?			**<0.001**	5%
1-Not applicable or never	1776 (32.9%)	333 (28.6%)		
2-Rarely	2146 (39.7%)	438 (37.6%)		
3-Occasionally	1020 (18.9%)	236 (20.2%)		
4-Frequently	304 (5.62%)	100 (8.58%)		
5-Often	107 (1.98%)	34 (2.92%)		
6-Always	53 (0.98%)	25 (2.14%)		

Table 2 (cont.) – Comparison of groups for categorical variables

Variable	**Have you ever DELIBERATELY cut, injured or burned yourself ?**		***p*-value**	**% Missing**
	No	**Yes**		
How often do others in your life complain to you about the amount of time you spend online?			0.376	5%
1-Not applicable or never	1436 (26.5%)	316 (27.1%)		
2-Rarely	1830 (33.7%)	368 (31.5%)		
3-Occasionally	1264 (23.3%)	262 (22.5%)		
4-Frequently	490 (9.04%)	120 (10.3%)		
5-Often	229 (4.22%)	57 (4.88%)		
6-Always	174 (3.21%)	44 (3.77%)		
How often do your grades or school work suffer because of the amount of time you spend online?			**<0.001**	5%
1-Not applicable or never	1712 (31.6%)	332 (28.4%)		
2-Rarely	1732 (31.9%)	356 (30.4%)		
3-Occasionally	1126 (20.8%)	238 (20.3%)		

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4-Frequently	446 (8.23%)	129 (11.0%)		
5-Often	257 (4.74%)	60 (5.13%)		
6-Always	149 (2.75%)	55 (4.70%)		
How often do you check your email before something else that you need to do?			**0.023**	5%
1-Not applicable or never	248 (4.58%)	51 (4.38%)		
2-Rarely	673 (12.4%)	126 (10.8%)		
3-Occasionally	1127 (20.8%)	221 (19.0%)		
4-Frequently	1188 (21.9%)	235 (20.2%)		
5-Often	1029 (19.0%)	237 (20.4%)		
6-Always	1149 (21.2%)	294 (25.3%)		
How often does your job performance or productivity suffer because of the Internet?			**<0.001**	6%
1-Not applicable or never	1554 (29.0%)	291 (25.3%)		
2-Rarely	1443 (26.9%)	288 (25.1%)		
3-Occasionally	1230 (22.9%)	244 (21.3%)		
4-Frequently	606 (11.3%)	147 (12.8%)		
5-Often	380 (7.08%)	112 (9.76%)		

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6-Always	151 (2.82%)	66 (5.75%)		
How often do you become defensive or secretive when anyone asks you what you do online?			**<0.001**	5%
1-Not applicable or never	2478 (45.7%)	512 (43.8%)		
2-Rarely	1731 (31.9%)	338 (28.9%)		
3-Occasionally	699 (12.9%)	171 (14.6%)		
4-Frequently	256 (4.72%)	65 (5.57%)		
5-Often	154 (2.84%)	38 (3.25%)		
6-Always	100 (1.85%)	44 (3.77%)		
How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet			**<0.001**	5%
1-Not applicable or never	2140 (39.6%)	321 (27.4%)		
2-Rarely	1192 (22.0%)	166 (14.2%)		
3-Occasionally	885 (16.4%)	239 (20.4%)		
4-Frequently	546 (10.1%)	164 (14.0%)		
5-Often	390 (7.21%)	149 (12.7%)		
6-Always	255 (4.72%)	131 (11.2%)		

Table 2 (cont.) – Comparison of groups for categorical variables

Variable	**Have you ever DELIBERATELY cut, injured or burned yourself ?**		***p*-value**	**% Missing**
	No	**Yes**		
How often do you find yourself anticipating when you will go online again?			**<0.001**	5%
1-Not applicable or never	2034 (37.6%)	410 (35.2%)		
2-Rarely	1550 (28.7%)	302 (25.9%)		
3-Occasionally	971 (18.0%)	195 (16.7%)		
4-Frequently	455 (8.42%)	114 (9.79%)		
5-Often	231 (4.27%)	67 (5.75%)		
6-Always	165 (3.05%)	77 (6.61%)		
How often do you fear that life without the Internet would be boring, empty, and joyless?:			**0.001**	5%
1-Not applicable or never	1891 (35.0%)	369 (31.6%)		
2-Rarely	1439 (26.6%)	296 (25.4%)		
3-Occasionally	1019 (18.8%)	225 (19.3%)		
4-Frequently	439 (8.11%)	101 (8.66%)		
5-Often	323 (5.97%)	71 (6.09%)		

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6-Always	299 (5.53%)	104 (8.92%)		
How often do you snap, yell, or act annoyed if someone bothers you while you are online?			**<0.001**	5%
1-Not applicable or never	3155 (58.5%)	622 (53.4%)		
2-Rarely	1353 (25.1%)	285 (24.5%)		
3-Occasionally	572 (10.6%)	155 (13.3%)		
4-Frequently	185 (3.43%)	45 (3.87%)		
5-Often	83 (1.54%)	30 (2.58%)		
6-Always	47 (0.87%)	27 (2.32%)		
How often do you lose sleep due to being online?			**<0.001**	5%
1-Not applicable or never	1313 (24.3%)	243 (20.9%)		
2-Rarely	1341 (24.8%)	251 (21.6%)		
3-Occasionally	1275 (23.6%)	270 (23.2%)		
4-Frequently	753 (13.9%)	175 (15.0%)		
5-Often	488 (9.04%)	138 (11.9%)		
6-Always	228 (4.22%)	86 (7.39%)		

Table 2 (cont.) – Comparison of groups for categorical variables

Variable	**Have you ever DELIBERATELY cut, injured or burned yourself ?**		***p*-value**	**% Missing**
	No	**Yes**		
How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?			**<0.001**	5%
1-Not applicable or never	2088 (38.6%)	433 (37.1%)		
2-Rarely	1741 (32.2%)	341 (29.2%)		
3-Occasionally	887 (16.4%)	196 (16.8%)		
4-Frequently	384 (7.11%)	87 (7.46%)		
5-Often	180 (3.33%)	59 (5.06%)		
6-Always	124 (2.29%)	51 (4.37%)		
How often do you find yourself saying "just a few more minutes" when online?			**0.001**	5%
1-Not applicable or never	895 (16.6%)	185 (15.9%)		
2-Rarely	1037 (19.2%)	183 (15.7%)		
3-Occasionally	1255 (23.2%)	243 (20.9%)		
4-Frequently	1014 (18.8%)	236 (20.3%)		
5-Often	689 (12.7%)	177 (15.2%)		

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6-Always	517 (9.56%)	139 (12.0%)		
How often do you try to cut down the amount of time you spend online and fail?			**<0.001**	5%
1-Not applicable or never	1166 (21.6%)	243 (20.9%)		
2-Rarely	1368 (25.4%)	246 (21.1%)		
3-Occasionally	1418 (26.3%)	294 (25.3%)		
4-Frequently	755 (14.0%)	173 (14.9%)		
5-Often	430 (7.97%)	110 (9.45%)		
6-Always	259 (4.80%)	98 (8.42%)		
How often do you try to hide how long you've been online?			**<0.001**	5%
1-Not applicable or never	2795 (51.9%)	569 (49.1%)		
2-Rarely	1376 (25.5%)	256 (22.1%)		
3-Occasionally	631 (11.7%)	154 (13.3%)		
4-Frequently	325 (6.03%)	75 (6.47%)		
5-Often	157 (2.91%)	53 (4.57%)		
6-Always	103 (1.91%)	52 (4.49%)		
How often do you choose to spend more time online over going out with others?			**<0.001**	5%
1-Not applicable or never	2356 (43.6%)	417 (35.9%)		
2-Rarely	1537 (28.5%)	312 (26.8%)		
3-Occasionally	886 (16.4%)	210 (18.1%)		
4-Frequently	339 (6.28%)	106 (9.11%)		
5-Often	175 (3.24%)	61 (5.25%)		
6-Always	109 (2.02%)	57 (4.90%)		
How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?			**<0.001**	5%
1-Not applicable or never	3098 (57.2%)	600 (51.5%)		
2-Rarely	1414 (26.1%)	300 (25.7%)		
3-Occasionally	560 (10.3%)	151 (13.0%)		
4-Frequently	193 (3.56%)	57 (4.89%)		
5-Often	87 (1.61%)	28 (2.40%)		
6-Always	66 (1.22%)	30 (2.57%)		

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The NSSI group showed a stronger association with neglecting household chores to spend more time online; decreasing job performance or productivity and school work because of the amount of time spent online; checking email (or social media) before something else that needed doing; and becoming defensive or secretive when anyone asked about online activities. Regarding number of episodes of NSSI, the highest number of events was associated only with use of the internet for blocking out disturbing thoughts about life.

With respect to feelings about internet use, the NSSI group exhibited a stronger association with feeling depressed, moody, or nervous when off-line, and with snapping and feeling annoyed when bothered while online.

The self-injury group also exhibited a stronger associated with the feeling of relating more with people on the internet than in person and with preferring relationships online; more frequent use of the internet for meeting new people, for keeping in touch with friends or for pursuing erotic encounters. Self-injurers reported preferring the excitement of the internet to intimacy with partner. The NSSI group made lesser use of the internet for keeping in touch with family.

The factors which, together, best explained the odds of self-injuring, based on the internet use questionnaire and sociodemographic variables, are presented in **Table 3.** These results reveal that use of the internet for dating every day increased the odds of self-injuring by 24% compared with not using the internet for dating. Preferring online relationships increased the odds of self-injury by 46% compared with preference for in person relationships. Choosing to spend more time online over going out with others occasionally, frequently, often, very often and always was associated with 27%, 53%, 77% and 143%, higher odds of engagement in self-injurious behavior, respectively, compared with never displaying this

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preference.

Table 3 – Multiple logistic regression of factors associated with self-injury including internet use and sociodemographic variables

Variable	Comparison	Reference	OR	LB	UB	*p*-value
Internet for dating	≤ 1 time/week	Never	1.17	0.91	1.49	0.220
	1-3 times/week		0.99	0.73	1.34	0.970
	3-6 times/week		1.15	0.83	1.56	0.392
	Every day		1.24	1.07	1.45	**0.005**
Prefer online relationships	Yes	No	1.46	1.04	2.02	**0.025**
How often do you block out disturbing thoughts about your life using the Internet	Rarely	Not applicable or never	0.85	0.69	1.05	0.144
	Occasionally		1.52	1.25	1.85	**<0.001**
	Frequently		1.61	1.28	2.02	**<0.001**
	Often		1.75	1.37	2.23	**<0.001**
	Always		2.06	1.57	2.70	**<0.001**
Choose to spend more time online over going out with others	Rarely	Not applicable or never	1.11	0.94	1.32	0.221
	Occasionally		1.27	1.04	1.54	**0.020**
	Frequently		1.53	1.17	1.98	**0.002**
	Often		1.77	1.25	2.49	**0.001**
	Always		2.43	1.63	3.59	**<0.001**
Age	Numeric variable	Numeric variable	0.96	0.94	0.98	**0.001**
Maternal ABEP score	Numeric variable	Numeric variable	0.99	0.99	1.00	**0.027**
Sex	Female	Male	2.15	1.87	2.48	**<0.001**

4. DISCUSSION

The present study revealed a significant association between NSSI and internet use. A total of 6,906 undergraduates were interviewed, 17% of whom reported having at least one episode of self-injury during their lifetime. Self-injurers reported greater use of the internet and concern over the amount time spent online while neglecting other activities compared with non-self-injurers. Although the present study is limited by its cross-sectional design, there is a dearth of in-depth studies investigating this association in the international literature. Hitherto, no studies exploring this topic have been conducted in Brazil.

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The systematic review conducted by Marchant *et al.* found similar results, showing that pathological use of or addiction to the internet and social media platforms was associated with NNSI behavior[15]. Despite difficulty finding a consensus definition on pathological use of the internet or dependence, the study reviewed 5 articles that employed these terms and showed a negative association of this internet use with NSSI. Results showed that only 2 of the studies found a mixed effect, attributing this to satisfaction and reducing loneliness[15].

Mészáros *et al* examined NSSI prevalence rates in adolescent normal, maladaptive and pathological internet users. The study found that maladaptive or pathological internet users had a higher frequency of NSSI behavior than normal users. Moreover, there was no significant difference in NSSI frequency between maladaptive and pathological users[19].

In spite of the difficulties standardizing criteria for dependence and pathological use of the internet in most articles investigating associations with self-injury, the evidence highlight the need for further scientific and clinical investigations on the subject. Reported concern by internet users upon recognizing their own maladaptive use is strongly associated with self-harming behaviors, as confirmed by the studies of Marchant and Meszaros, and also by the present investigation. A straightforward question such as: “are you concerned about the way you use the internet” in self-injurers can provide the basis for devising a broader therapy plan which incorporates behavioral changes.

In Brazil, indiscriminate use of the internet and social networks also correlates with higher rates of mental disorders, NSSI behavior and suicide. Between 2011 and 2022, the number of notifications of NSSI in the young population rose nine-fold[20]. Although the causes for this trend are multifactorial, such as higher prevalence of mental disorders, socioeconomic inequalities and

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poor access to health services[20], the influence of the use of the internet and social media on NSSI and suicide cannot be overlooked. The present investigation is the first Brazilian study of its kind to show an association between NSSI and internet use in a representative sample of adolescents.

With regard to the characteristics of internet use, the present study showed that participants exhibiting NSSI behavior made greater use of the internet for relationships involving friendship, love and eroticism, preferring the excitement of the internet to intimacy with a partner. The theory that best explains this finding is that the anonymous nature of online interaction can be attractive to those with psychic anguish or emotional problems, who cannot express their feelings with family or close friends[21, 22]. In our analysis, questions about the specific type of internet use were not included; therefore, information on the main websites or social media platforms used is not available. However, this does not affect the characterization of the overall internet use profile.

The relieving of emotional pain and seeking help from others are functions of NSSI behavior reported by self-injurers[23] , showing difficulty in being able to verbally communicate with acquaintances about personal anguish experienced[24]. In this respect, the virtual environment can function as a facilitator of this communication, given the more distant relationship with others, the immediate response involved and influence of social media algorithms. Upon self-declaring that “I am a cutter”, the adolescent forges a bond with other self-injurers, conferring a sense of self and group identity, where this exhibits some level of coherence over time[25].

Despite the known difficulty talking about this behavior, the study conducted by Silva Bandeira *et al* involving interviews with 6,906 undergraduates showed that NSSI is a behavior that can be shared. In the study, over 60% of participants

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reported having learned about the behavior from friends, family members or social media platforms. In addition, over one third of the students reported needing help to deal with the behavior but were unable to access this, citing barriers of lack support network, access difficulty, shame, or other reasons not specified explicitly[6]. This profile corroborates the results of the present study in as far as these barriers to seeking help do not occur in an online environment.

The finding of preferring the internet for relationships raises questions regarding the potential benefit of the internet among self-injurers as a means of attenuating loneliness. The systematic review by Daine *et al* (2013) sought to identify these positive and negative influences of the internet on self-harm and suicide in young people. Fourteen articles were selected, 9 of which showed a positive or mixed impact of Internet use on NSSI behavior. A positive association was also reported in articles analyzing forums which served as a support community for dealing with NSSI behavior[26]. Given the risk associated with self-harming behavior, there is a need for quality studies specifically describing the beneficial online activities as opposed to making generalizations[26].

Another reason reported by self-injurers to explain the behavior is to resist suicidal thoughts[27]. There is a higher risk of suicide among individuals that self-harm, irrespective of other diagnoses of mental disorders. Silva Bandeira *et al* found an association between the number of episodes of self-harm and suicidal behavior where, the higher the number of self-inflicted injuries, the greater the chance of individual having suicidal thoughts, ideation or attempted suicide[6]. In the present study, highest number of episodes of self-harm was associated with the use of the internet to block out disturbing thoughts about life. Although the nature of these thoughts was not specified, it is implied that they include suicidal thoughts.

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The effect of social media on children and adolescents differs, depending on their individual strengths and vulnerabilities, such as maturity of social and communication abilities, as well as cultural, historical and socioeconomic factors[28, 29]. In view of the internet use profile of self-injurers in the current study, such as preferring the internet for relationships or for blocking out disturbing thoughts, there is an incentive for both clinical and scientific purposes to investigate not only usage time, but the individual and development characteristics which lead adolescents and young adults to resort to the internet more frequently. Replacing physical environments and face-to-face relationships and turning to unknown environments for help may pose risks to the mental health and lives of adolescents and young adults.

CONCLUSION

The present study has some limitations, such as its observational cross-sectional design, precluding any meaningful discussion about risks. Not with standing this short coming, this is the largest study exploring NSSI in Brazilians. Our findings suggest that feelings of loneliness may lead individuals who engage in nonsuicidal self-injury to seek connection through online interactions, where anonymity and accessibility can create a perceived sense of belonging and emotional expression.

In recent years, mounting evidence has supported the association between INSS and internet use, internet dependence and online interventions, reported by high or medium-level quality investigations[15]. Despite results showing associations with mental disorders, self-harm and suicidal behavior, there is a reluctance to discuss measures for regulating Internet use by children and adolescents. One of the problems encountered by scientific literature is the high heterogeneity of

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studies, hampering generalizations of results and their introduction into clinical practice or policies[30]. Future studies exploring the subject of mental health and internet use are warranted, along with active involvement of scientists in the process of policy-making on this issue.

DECLARATIONS

Ethical Approval

The study project and free and informed consent form were approved on 01/02/2017 by the Research Ethics Committee of the Unicamp School of Medical Science under permit no 1.903.287 (CAAE 62765316.6.0000.5404).

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