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RESEARCH ARTICLE

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The DSM-5 nonsuicidal self-injury disorder among incoming college students: Prevalence and associations with 12-month mental disorders and suicidal thoughts and behaviors

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Background: Approximately one in five college students report a history of nonsuicidal self-injury. However, it is unclear how many students meet criteria for the recently proposed DSM-5 nonsuicidal self-injury disorder (NSSI-D). In this study, we used full NSSI-D criteria to identify those students most in need of clinical care.

Methods: Using data from the Leuven College Surveys (n = 4,565), we examined the 12-month prevalence of DSM-5 NSSI-D in a large and representative sample of incoming college students. We also explored the optimal frequency threshold as a function of interference in functioning due to NSSI, and examined comorbidity patterns with other 12-month mental disorders (i.e., major depressive disorder, broad mania, generalized anxiety disorder, panic disorder, and alcohol dependence) and suicidal thoughts and behaviors (STB).

Results: Twelve-month NSSI-D prevalence was 0.8% and more common among females (1.1%) than males (0.4%). The proposed 5+ diagnostic threshold was confirmed as yielding highest discrimination between threshold and subthreshold cases in terms of distress or disability due to NSSI. A dose–response relationship was observed for NSSI recency–severity (i.e., 12-month NSSI-D, subthreshold 12-month NSSI-D, past NSSI, no history of NSSI) with number of 12-month mental disorders and STB. NSSI-D occurred without comorbid disorders for one in five individuals, and remained associated with severe role impairment when controlling for the number of comorbid disorders.

Conclusions: These findings offer preliminary evidence that DSM-5 NSSI-D is uncommon among incoming college students, but may help to improve the deployment of targeted resource allocation to those most in need of services. More work examining the validity of NSSI-D is required.

KEYWORDS
college students, DSM-5, mental disorders, nonsuicidal self-injury, suicide

1 | INTRODUCTION

College entrance often marks the transition between adolescence and young adulthood (Arnett, 2015), a crucial developmental period for the occurrence of mental health problems (Auerbach et al., 2016; Hunt & Eisenberg, 2010; Zivin, Eisenberg, Gollust, & Golberstein, 2009). Nonsuicidal self-injury (NSSI), the intentional destruction of one's body tissue with no intent to die (Nock & Favazza, 2009), including behaviors, such as skin cutting, burning, and self-battery, is eliciting increased concern on college campuses worldwide. International pooled prevalence estimates indicate approximately 20% of college students report engaging in any self-injury in their lifetime (Swannell, Martin, Page, Hasking, & John, 2014), and 12-month rates range between 2 and14% (Serras, Saules, Cranford, & Eisenberg, 2010; Wilcox et al., 2012). NSSI is most often used to escape emotional turmoil (Bentley, Nock, & Barlow, 2014) and has been associated with greater risk of subsequent suicidal thoughts and behaviors (STB; Hamza &Willoughby, 2016; Mortier et al., 2017; Whitlock et al., 2013), low levels of help seeking (Gollust, Eisenberg, & Golberstein, 2008; Whitlock et al., 2011), and poorer academic performance (Kiekens et al., 2016). This has led researchers, clinicians, and policy makers to argue that clinical services should be offered to college students with a history of NSSI.

However, in a resource-limited environment, addressing NSSI effectively necessitates accurate identification of those students most in need of services. Indeed, there are likely important differences in clinical severity among students who have ever engaged in NSSI. For instance, college students who engage in more frequent and ongoing NSSI may be at greater risk of adverse outcomes than those who have ceased their self-injury, or have only experimented with NSSI once or twice (Hamza & Willoughby, 2014; Kiekens et al., 2017; Whitlock, Muehlenkamp, & Eckenrode, 2008). To better understand NSSI severity and need for services among people who self-injure, the most recent edition of the *Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition* (*DSM-5*) includes NSSI-Disorder (NSSI-D) as a "condition requiring further study" (American Psychiatric Association [APA], 2013). This newly proposed disorder identifies those with more frequent NSSI (i.e., at least 5 days in the past year) who experience significant distress or interference in one or more areas of life due to their self-injury. Other diagnostic criteria include presence of a psychological precipitant (e.g., negative feelings), urge that is difficult to control prior to NSSI or frequent thoughts about NSSI, and the expectation that self-injury will provide emotional or cognitive relief, resolve interpersonal difficulties, or lead to positive feelings (APA, 2013).

To date, studies that have examined NSSI-D using full DSM-5 criteria are scarce (see Zetterqvist, 2015), but emerging evidence from epidemiological studies suggests that the prevalence of NSSI-D may be quite low in community samples (less than 1%; Benjet et al., 2017; Plener et al., 2016). However, as no prior study has assessed the full DSM-5 criteria in a representative sample of college students, it remains unclear whether rates are also low in college students, or whether the high rate of NSSI engagement translates to an elevated rate of NSSI-D. The proposed study was designed to address this gap. In addition, more work is needed regarding the diagnostic correlates of NSSI-D. Prior research has shown that NSSI commonly cooccurs with other mental health problems (especially emotional disorders and STB; Benjet et al., 2017; Bentley, Cassiello-Robbins, Vittorio, Sauer-Zavala, & Barlow, 2015; Taliaferro & Muehlenkamp, 2015), yet is not pathognomonic of any particular condition (see Selby, Kranzler, Fehling, & Panza, 2015). Initial studies among clinical samples confirm the diagnostic heterogeneity of NSSI-D, but also observed that individuals who meet disorder criteria present with a more clinical profile than those not meeting criteria (Glenn & Klonsky, 2013; In-Albon, Ruf, & Schmid, 2013; Washburn, Potthoff, Juzwin, & Styer, 2015). Building upon these findings, we considered comorbidity patterns with other 12-month mental disorders and STB, and explored differences compared to those who engage in NSSI but do not meet criteria (i.e., subthreshold NSSI-D) and those who may once have engaged in, but have subsequently ceased, their self-injury (i.e., past NSSI). This will provide meaningful information about how NSSI-D corresponds to other mental health problems and inform discussions regarding the potential clinical relevance of DSM-5 NSSI-D.

Here, we report data from the Leuven College Surveys (LCS, n.d.)—part of the WHO World Mental Health International College Student Project (WMH-ICS, n.d.)—which includes representative samples of college students, surveyed to assess a wide range of mental health outcomes. Our main objectives were to (1) estimate the 12-month prevalence of *DSM-5* NSSI-D (2) and examine associations with other 12-month mental disorders (i.e., major depressive disorder, broad mania, generalized anxiety disorder, panic disorder, and alcohol dependence) and 12-month STB (i.e., suicide ideation, plan, and attempt). Given debate regarding the clinically meaningful number of NSSI occurrences for diagnosis (Ammerman, Jacobucci, Kleiman, Muehlenkamp, & McCloskey, 2017; Muehlenkamp, Brausch, & Washburn, 2017), we will also explore the association between number of NSSI occurrences in the past year and experience of distress or disability due to NSSI. Finally, to inform discussions about the validity of NSSI-D as a unique mental disorder (Selby et al., 2015), we will test whether NSSI-D is associated with severe role impairment in daily life when controlling comorbid disorders.

2 | METHODS

2.1 | Procedures and sample

KU Leuven is Belgium's largest university with an enrollment of over 40,000 students. Between 2014 and 2016, all 8,530 freshmen were eligible for inclusion in the study (i.e., *census sampling*). Detailed recruitment strategies of the LCS are described elsewhere (Kiekens et al., 2016). In brief, all eligible students were invited to participate, with nonrespondents sent up to seven reminder emails. In total, 4,565 freshmen (56.8% female, M_{age} = 18.3, SD = 1.1) completed all relevant sections (response rate = 53.5%). All procedures were in accordance with the 1964 Helsinki declaration and its later amendments. The study was approved by the university hospital and by the Belgian commission for the protection of privacy.

2.2 | Measures

2.2.1 | Nonsuicidal self-injury

NSSI history was assessed using items from the self-report version of the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007). The original SITBI has strong psychometric properties including good construct validity for NSSI ($\kappa = 0.74–1.0$) and excellent test–retest reliability for the presence of NSSI ($\kappa = 1.0$; Nock et al., 2007). The self-report version used in the current study also showed excellent test–retest reliability ($\kappa = 1.0$) and external validity ($\kappa = 1.0$) in a study designed to compare self-report measures of self-harm (Latimer, Meade, & Tennant, 2013). Respondents were presented with a behavior checklist, including 13 nonsuicidal self-injurious behaviors (e.g., cutting or carving skin) and an "other" category.

Using the SITBI and additional questions that map onto each of the *DSM-5* criteria (see Supporting Information, Table 1), students were classified as belonging to one of the four following groups: (1) NSSI-D (i.e., those meeting all *DSM-5* criteria), (2) subthreshold NSSI-D (i.e., NSSI in past 12 months without meeting all *DSM-5* criteria required for diagnosis), (3) past NSSI (i.e., NSSI history, but not in past 12 months), or (4) controls (i.e., respondents without prior NSSI). Additional questions assessed age of onset and medical treatment history for NSSI.

2.2.2 | Twelve-month STB

STB within the preceding 12 months also were assessed with the self-report version of the SITBI (Nock et al., 2007). STB was conceptualized as a continuum, and included suicide ideation (i.e., having thoughts of killing yourself), suicide plan (i.e., thinking about how you might kill yourself or working out a plan of how to kill yourself), and a suicide attempt (i.e., purposefully hurt yourself with at least some intent to die). Construct validity of the SITBI ranged from substantial to good for STB ($\kappa = 0.48–0.65$), with test–retest reliability ranging from good to excellent for the presence of STB ($\kappa = 0.70–1.00$; Nock et al., 2007).

2.2.3 | Twelve-month mental disorders

The Screening Scales of the Composite International Diagnostic Interview (CIDI-SC; Kessler & Ustün, 2004) were used to assess two 12-month mood disorders (i.e., major depressive disorder and [Hypo]mania) and two anxiety disorders (generalized anxiety disorder and panic disorder). The CIDI-SC was developed by the WHO to deliver reliable estimates of DSM-IV mental disorder diagnosis, with previous research indicating good concordance for the assessed disorders (AUC = .70–.78) between CIDI-SC and independent clinical diagnoses based on blinded structured clinical interviews (Kessler, Santiago, et al., 2013). Using the well-validated Alcohol Use Disorders Identification Test (DeMartini & Carey, 2012; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), students with 12-month risk for alcohol dependence were also identified.

2.2.4 | Severe role impairment

Role impairment in daily life was assessed with a revised version of the Sheehan Disability Scale from the CIDI (Kessler & Ustün, 2004). This measure asks respondents the extent to which problems with physical or mental health in the past year interfered with home management, quality of work, social life, and close personal relationships. Severe role impairment was defined as a 7–10 rating in one or more domains (Kessler et al., 2014).

2.3 | Statistical analyses

To assess the representativeness of our data, a representativeness indicator (R-indicator) was calculated on a broad range of sociodemographic characteristics available for all students in the population: gender, age, nationality, parental financial situation, parental educational level, family composition, secondary school type, and current field of study (Kiekens et al., 2016). R-indicator values range between 0 and 1, with the latter indicating sample data are fully representative with respect to the population characteristics considered (Schouten, Cobben, & Bethlehem, 2009). Potential residual nonresponse bias was taken into account using nonresponse propensity weighting techniques (Lee, 2006). This approach enables us to obtain estimates representative for the full population of incoming students. Prevalence estimates are reported as weighted proportions with associated standard errors. Associations between categorical variables were analyzed using crosstabulations and the Rao-Scott chi square statistic. Differences between groups on continuous variables were analyzed using ANOVA or Welch *F* statistic, and Bonferroni or Games-Howell post hoc tests were performed, as appropriate. Using penalized maximum likelihood estimation (Heinze, 2006), odds ratio's (OR) with 95% confidence intervals (CI) were estimated to (1) examine whether NSSI-D captures individuals at increased risk for 12-month mental disorders and STB, (2) assess the optimal threshold for diagnosis (criterion A) as a function of experience of distress or disability due to NSSI (criterion E) using dummy variables for number of NSSI occurrences in the past year, and (3) examine the residual association between NSSI-D and severe role impairment when controlling for the number of comorbid disorders. Analyses were performed with SAS (version 9.4) and SPSS (version 23).

3 | RESULTS

3.1 | Sample representativeness

Table 1 shows the characteristics of the sample. An R-indicator of 0.87 was observed, indicating good representativeness of the respondent data based on these characteristics relative to the entire population of college freshmen.

3.2 | Prevalence rates and descriptive analyses

Across the sample, 17.7% (SE = 0.6) reported engaging in NSSI at some point in their lifetime and 9.5% (SE = 0.4) reported that they did so in the past 12 months. The three most common forms of self-injury included "smashing hands or feet against the wall or other objects" (8.7%, SE = 0.4), "cutting or carving the skin" (6.1%, SE = 0.4), and "scraping the skin" (5.0%, SE = 0.3). Twelve-month prevalence of past NSSI, subthreshold NSSI-D, and NSSI-D were estimated at 8.2%

TABLE 1 Characteristics of the sample ($n = 4{,}565$)

	% (*w*)	SE
Female sex	56.8	0.7
Age		
17 or younger	5.5	0.3
18 years	71.1	0.7
19 years	18.1	0.6
20 years or more	5.3	0.4
Belgian nationality	95.3	0.3
Parents' financial situation difficult	17.3	0.6
Parental education		
Both parents high	62.1	0.7
Only one parent high	22.6	0.6
None of the parents high	15.3	0.5
Nonintact familial composition	23.3	0.6
University group membership		
Biomedical sciences	19.3	0.6
Human sciences	54.6	0.7
Science and technology	26.1	0.6
General secondary education	94.5	0.3

% (*w*), weighted percetage; SE, standard error.

(SE = 0.4), 8.8% (SE = 0.4), and 0.8% (SE = 0.1), respectively. Table 2 presents an overview of NSSI-D criteria endorsed across each group. Prevalence rates of NSSI-D were significantly higher in females (1.1%, SE = 0.2) than males (0.4%, SE = 0.1, $\chi^2_{1df} = 6.7$, $P = .010$).

Individuals with NSSI-D ($M = 5.4$, SD = 2.6, F_{welch} 2,87 = 31.9 $P < .001$) utilized more NSSI methods than those with past NSSI ($M = 1.9$, SD = 1.4, $P < .001$) or subthreshold NSSI-D ($M = 2.3$, SD = 1.7, $P < .001$). Age of onset of NSSI ($M = 13.8$, SD = 3.4) was not significantly different across groups (F_{welch} 2,96 = 0.6 $P = .558$). Students meeting NSSI-D criteria more often required medical treatment for injuries (22.9%, SE = 7.1) than past or subthreshold cases (5.1–5.6% range, $\chi^2_{2df} = 17.2$, $P < .001$).

3.3 | The optimal frequency threshold (criterion A) as a function of interference (criterion E)

The currently proposed diagnostic threshold of five or more NSSI occurrences in the past year was most strongly associated with NSSI-specific interference (OR = 3.1, 95% CI = 1.2–8.1, $P = .010$; Figure 1). Increasing the diagnostic threshold did not result in higher proportions reporting interference above and beyond the *DSM-5* proposed criteria.

3.4 | Associations with other 12-month mental disorders and STB

Table 3 summarizes the associations with other 12-month mental disorders and STB across NSSI categories. Of those with NSSI-D, 80.7% (SE = 6.6) also met criteria for at least one mental disorder in the last 12 months, with more than half having two or more comorbid disorders. Conversely, of those with at least one mental disorder, only 3.3% (SE = 0.6) met criteria for NSSI-D. NSSI-D cooccurred most frequently with 12-month MDD (63.8%, SE = 8.1), but was associated with higher odds of all examined 12-month disorders relative to controls (OR = 5.7–46.5), past NSSI (OR = 3.1–12.8), and subthreshold NSSI-D (OR = 3.4–6.0). Further, more than half of college students with NSSI-D reported 12-month suicide ideation (61.8%, SE = 8.3) and suicide plans (51.6%, SE = 8.5). One in 10 students with NSSI-D also reported a suicide attempt in the past 12 months. Meeting NSSI-D criteria was associated with higher odds of STB when compared to controls (OR = 36.3–331.9), students with past NSSI (OR = 12.9–97.8), and with subthreshold NSSI-D (OR = 4.9–8.5).

3.5 | Severe role impairment in daily life

Severe role impairment in daily life, as assessed with the Sheehan Disability Scale, was reported by 10.3% (SE = 0.5) of the sample, and was substantially more common among students with (58.9%, SE = 8.3) than without NSSI-D (10.0%, SE = 0.5; $\chi^2_{1df} = 89.5$, $P < .001$). When controlling for the number of comorbid disorders[1], NSSI-D remained significantly associated with severe role impairment (Table 4).

4 | DISCUSSION

To the best of our knowledge, this is the first study that uses the full *DSM-5* criteria to provide information about the prevalence and diagnostic correlates of NSSI-D among college students. Several important findings warrant brief comment. First, consistent with recent work among young adults in the general population (Benjet et al., 2017), the proposed *DSM-5* criteria lead to more conservative prevalence estimates when considering severe NSSI. Although approximately one in six reported a history of self-injury, and one in 10 reported past year NSSI, only 0.8% met criteria for NSSI-D. Given that most studies focus on lifetime or 12-month NSSI, which does not capture NSSI severity and need for clinical services, this is an important epidemiological finding. This shows that assessment of NSSI-D might help identify realistic proportions—that is, an estimated 32 individuals out of more than 4,000 incoming students each year in our university—needing specialized care for NSSI. In line with previous studies (Plener et al., 2016; Zetterqvist, 2015), NSSI-D was more common among females.

Second, the proposed 5+ threshold was confirmed as yielding highest discrimination between threshold and subthreshold cases in terms of distress or disability due to NSSI. While this is in line with other work in college students (Ammerman et al., 2017), derived thresholds were higher in clinical samples (Muehlenkamp et al., 2017). However, given the characteristics of such data, empirically derived thresholds can always be assumed to yield higher cutoffs in clinical samples. Arguably, establishing accurate thresholds requires representative population data capturing the full range of NSSI severity. It will be important for future prospective studies to evaluate whether the currently proposed diagnostic criteria accurately predict a more severe course of self-injury.

Third, in line with emerging evidence (Glenn & Klonsky, 2013; In-Albon, et al., 2013; Washburn et al., 2015), students who meet

TABLE 2 *DSM-5* criteria of nonsuicidal self-injury disorder among college sample

		Past NSSI $n(w) = 373$ % (SE)	Subthreshold NSSI-D $n(w) = 401$ % (SE)	NSSI-D $n(w) = 34$ % (SE)
Criterion A	In the last year, the individual has on 5 or more days engaged in intentional self-inflicted damage to the surface of his or her body without suicidal intent.	0	16.9 (1.9)	100
Criterion B	The individual engages in the self-injurious behavior with one or more of the following expectations:	83.6 (1.9)	74.7 (2.2)	100
	B1) To relieve negative thoughts or feelings	74.4 (2.3)	70.2 (2.3)	96.8 (3.2)
	B2) To resolve an interpersonal difficulty	27.3 (2.3)	21.1 (2.1)	38.3 (8.3)
	B3) To induce a positive state	35.3 (2.5)	34.5 (2.4)	66.3 (8.0)
Criterion C	The intentional self-injury is associated with at least one of the following:	83.5 (1.9)	79.9 (2.0)	100
	C1) Negative thoughts or feelings or interpersonal problems occurring in the period immediately prior to the self-injurious act.	82.3 (2.0)	76.0 (2.2)	100 (0.0)
	C2) Prior to engaging in NSSI, there is a period of preoccupation with NSSI that is difficult to control	14.2 (1.8)	17.5 (1.9)	64.3 (8.2)
	C3) Thinking about self-injury that occurs frequently, even when it is not acted upon	2.6 (0.8)	15.7 (1.8)	80.7 (7.0)
Criterion D	The behavior is not socially sanctioned (e.g., part of religious ritual) and is not restricted to picking a scab or nail biting.	98.9 (0.5)	97.5 (0.8)	100
Criterion E	The behavior or its consequences cause:	25.3 (2.3)	19.7 (2.0)	100
	(E1) Clinically significant distress	13.1 (1.7)	9.7 (1.5)	39.9 (8.3)
	(E2) Interference in interpersonal functioning	14.9 (1.9)	9.9 (1.5)	65.3 (8.1)
	(E3) Interference in academic functioning	9.8 (1.6)	7.4 (1.3)	42.3 (8.4)
	(E4) Interference in other important areas of functioning	13.9 (1.8)	9.8 (1.5)	37.6 (8.3)
Criterion F	The behavior does not occur exclusively in the context of another syndrome (e.g., substance intoxication) and cannot be explained better by another medical syndrome (e.g., trichotillomania or excoriation disorder).	97.8 (0.8)	96.4 (0.9)	100
Criteria met	One or more	100 (0.0)	100 (0.0)	100
	Two or more	98.8 (0.6)	98.4 (0.6)	100
	Three or more	92.1 (1.4)	90.6 (1.5)	100
	Four or more	75.6 (2.2)	71.8 (2.3)	100
	Five	22.7 (2.2)	24.3 (2.2)	100

NSSI, nonsuicidal self-injury; NSSI-D, nonsuicidal self-injury disorder; n(*w*), weighted number; SE, standard error.

diagnostic criteria for NSSI-D had a more clinical profile than those not meeting criteria. While this confirms a high level of clinical severity and need for services (Merikangas & Kalaydjian, 2007), it also raises questions regarding the reasons for these high rates of comorbid 12-month mental disorders and STB. One potential explanation may be shared risk factors and etiological pathways (e.g., childhood adversities, internalizing coping strategies, difficulties in emotion regulation; Bentley et al., 2015; Kiekens et al., 2015; Nock, 2009). Such findings would support a unified approach to prevention and treatment. A second possibility is that the presence of one condition increases risk of another. For example, people with mental disorders may use NSSI to regulate strong aversive internal and social experiences (Klonsky, Glenn, Styer, Olino, & Washburn, 2015; Nock & Prinstein, 2004). However, over time, NSSI itself may also lead to significant distress (e.g., feelings of shame; Mahtani, Melvin, & Hasking, 2017) and disability (e.g., social isolation; Stänicke, Haavind, & Gullestad, 2018). Relatedly, theoretical accounts suggest that frequent NSSI may gradually prepare an individual to make a suicide attempt, by building up an acquired capability for suicide through simultaneously lowering fear of death and heightening pain tolerance (Joiner, 2005; Van Orden et al., 2010; Willoughby, Heffer, & Hamza, 2015). That said, we also found that NSSI-D is not simply a marker of any particular disorder (Selby et al., 2015). Only 3% of people with mental disorders meet diagnostic criteria for NSSI-D, and for a small, but significant, group of young people (approximately 20%), NSSI-D occurred outside the context of a comorbid 12-month mental disorder. Further, our analyses indicated that NSSI-D is related to severe role impairment in daily life, over and above the presence of other debilitating mental disorders. Building upon these findings, future work should consider whether NSSI-D is prospectively associated with greater risk for adverse outcomes (e.g., college dropout, lower quality of life, higher risk for a suicide attempt) throughout the academic career.

Finally, while findings show that incoming college students with NSSI-D are most in need of clinical interventions, students with

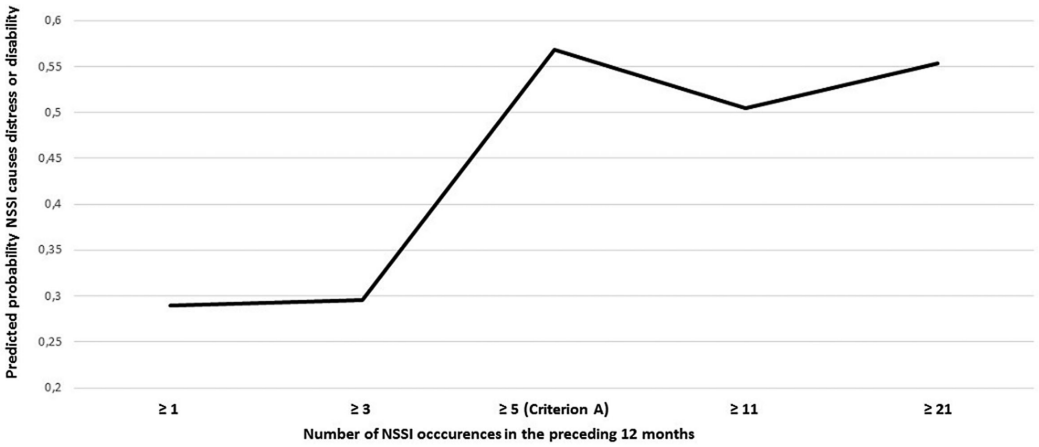

FIGURE 1 Associations between number of NSSI occurrences in the preceding 12 months (criterion A) and reported interference due to NSSI (criterion E) among students who self-injured in the past year and meet all other DSM-5 criteria (B, C, D, and F)

ongoing NSSI who do not meet *DSM-5* criteria, and even some with past NSSI behavior, remain at elevated risk for other 12-month mental disorders and STB. This shows that students with infrequent or less severe NSSI should not be overlooked when planning mental health promotion programs. Future research is warranted considering a stepped care approach to responding to self-injury on college campuses. Perhaps, less intensive forms of care (e.g., e-mental health) might be more appropriate to target less severe NSSI; addressing such questions in future research will ultimately inform appropriate resource allocation among the millions of college students who self-injure each year.

4.1 | Limitations and future directions

Several limitations of the study should be noted. First, the response rate was relatively low (i.e., 53.5%), yielding the possibility of non-response bias that may limit the external validity of our findings. The observed R-indicator suggested a good sociodemographic

TABLE 3 Prevalence Rates of other 12-month mental disorders, suicidal thoughts, and behaviors and comparisons with nonsuicidal self-injury disorder

	Prevalence rates				Comparisons		
	Controls	Past NSSI	Subthreshold NSSI-D	NSSI-D	Controls versus NSSI-D	Past NSSI versus NSSI-D	Subthreshold versus NSSI-D
	%(w) (SE)	%(w) (SE)	%(w) (SE)	%(w) (SE)	OR (95% CI)	OR (95% CI)	OR (95% CI)
12-Month mental disorders							
Major depressive disorder	7.1 (0.4)	21.1 (2.1)	33.8 (2.4)	63.8 (8.1)	**22.7** (11.3–45.5)	**6.4** (3.1–13.4)	**3.4** (1.7–6.9)
Broad mania	0.6 (0.1)	1.9 (0.7)	4.2 (1.0)	20.4 (6.9)	**46.5** (18.5–117.1)	**12.8** (4.2–38.9)	**6.0** (2.3–15.6)
Generalized anxiety disorder	5.0 (0.4)	17.6 (2.0)	19.5 (2.0)	54.1 (8.5)	**22.1** (11.2–43.6)	**5.5** (2.7–11.1)	**4.8** (2.4–9.8)
Panic disorder	1.2 (0.2)	5.6 (1.2)	5.8 (1.2)	22.2 (7.0)	**25.0** (10.8–58.2)	**4.9** (2.0–12.2)	**4.8** (1.9–11.7)
Alcohol dependence	3.4 (0.3)	6.1 (1.3)	5.5 (1.2)	16.1 (6.6)	**5.7** (2.3–14.1)	**3.1** (1.2–8.3)	**3.4** (1.3–9.2)
Any positive screen	13.4 (0.6)	35.5 (2.5)	44.4 (2.5)	80.7 (6.6)	**25.6** (11.2–58.6)	**7.9** (3.1–16.8)	**5.0** (2.1–11.6)
Number of mental disorders							
None	86.6 (0.6)	64.5 (2.5)	55.6 (2.5)	19.3 (6.6)	Ref.	Ref.	Ref.
Exactly one	10.1 (0.5)	21.9 (2.2)	25.5 (2.2)	19.6 (6.7)	**8.7** (3.1–24.7)	**3.0** (1.0–8.7)	2.2 (0.8–6.4)
Exactly two	2.8 (0.3)	10.3 (1.6)	15.0 (1.8)	34.4 (8.1)	**53.2** (20.6–136.8)	**10.7** (4.0–28.7)	**6.4** (2.4–16.8)
Three or more	0.5 (0.1)	3.3 (0.9)	4.0 (1.0)	26.7 (7.6)	**224.8** (76.7–658.4)	**25.6** (8.2–79.7)	**18.6** (6.2–56.1)
χ^2 (*P*-value)					462.6 ($P < .001$)	60.1 ($P < .001$)	45.7 ($P < .001$)
12-Month suicidal thoughts and behaviors							
Suicide ideation	4.2 (0.3)	10.9 (1.6)	24.3 (2.2)	61.8 (8.3)	**36.3** (18.1–72.9)	**12.9** (6.1–27.4)	**4.9** (2.4–10.1)
Suicide plan	0.9 (0.2)	3.1 (0.9)	11.0 (1.6)	51.6 (8.5)	**115.9** (55.0–244.1)	**31.6** (13.0–76.3)	**8.5** (4.1–17.7)
Suicide attempt	0.0 (0.0)	0.0 (0.0)	1.7 (0.7)	10.5 (5.0)	**331.9** (40.5–2719.6)	**97.8** (3.5–2759.2)	**6.9** (1.9–25.8)

Associations shown in bold are significant ($P < .05$). NSSI, nonsuicidal self-injury; NSSI-D, nonsuicidal self-injury disorder; %(w), weighted percentage; SE, standard error; OR, odds ratio; CI, confidence interval.

TABLE 4 Associations with severe role impairment in daily life

	OR (95% CI)	*P*
NSSI disorder[a]	2.9 (1.3–6.6)	.010
Number of comorbid disorders		
None	Ref.	
Exactly one	4.9 (3.9–6.3)	.002
Exactly two	12.4 (9.1–16.8)	<.001
Three or more	40.6 (21.9–75.1)	<.001

[a]Odds of impairment associated with NSSI disorder after controlling for number of comorbid disorders.

representativeness of the respondent data and all analyses were nonresponse propensity weighted; however, this remains a concern. Second, although we used full DSM-5 criteria, it should be noted that we assessed the number of NSSI occurrences in the past year as opposed to the number of days (as stated in criterion A). Future studies would benefit from using a measure specifically developed to assess NSSI-D (see Victor, Davis, & Klonsky, 2017). Further, we used screeners rather than full diagnostic interviews to assess comorbid 12-month mental disorders. Although these screeners have shown good concordance in clinical reappraisal studies (Kessler, Calabrese, et al., 2013, Kessler, Santiago, et al., 2013), they are not a substitute for indepth clinical interviews. Therefore, it will be important for future research to examine the consistency of the findings obtained here with those in studies using clinical interviews.

Third, due to the low prevalence of NSSI-D, our analyses of psychiatric comorbidity were restricted to bivariate models. It is therefore likely that some associations are actually effects of other comorbid disorders. Relatedly, we controlled the number of comorbid disorders when examining the association between NSSI-D and severe role impairment in daily life. This assumes that the effect of comorbid mental disorders is additive and independent of disorder type. Future studies with larger sample sizes should relax these constraints in more complex models that also include disorder type and allow for interactions. Fourth, some comorbid mental disorders (e.g., eating disorders, posttraumatic stress disorder, and borderline personality disorder [BPD]) were not included and warrant more research. BPD is relevant in this context, as NSSI is included in DSM-5 as a symptom of BPD (APA, 2013). More work is warranted that specifically investigates variation in etiological mechanisms, as well as prognosis and treatment response, of persons with different disorder profiles (e.g., NSSI-D with vs. without comorbid BPD). Studies that conceptualize personality disorders from a dimensional approach, as currently listed in Section III of DSM-5 (APA, 2013), will be particularly useful in providing a thorough understanding of personality traits that may underlie NSSI-D for some individuals, irrespective of whether an actual personality disorder is present. Despite these limitations, the present study adds valuable information to the emerging literature about NSSI-D.

5 | CONCLUSIONS

NSSI prevalence rates are prohibitively high to feasibly offer specialized clinical care to all incoming college students who have engaged in this behavior. Our data suggest that the proposed DSM-5 criteria could help to improve the deployment of targeted resource allocation for a small group of incoming college students who engage in frequent, and clinically severe, NSSI that causes distress or disability. These students will often present with a more clinical profile that emphasizes the need for a thorough clinical assessment. We found evidence that the proposed 5+ diagnostic threshold meaningfully distinguishes students who experience distress or disability due to their self-injury, and observed that NSSI-D is associated with severe role impairment in daily life above and beyond number of comorbid mental disorders. While these findings provide preliminary support for the validity and utility of NSSI-D, future studies should advance our understanding of the risk factors, course, and potential burden of this newly proposed disorder in order to determine its relative merit for college mental health.

CONFLICT OF INTEREST

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis, he was a consultant for Johnson & Johnson Wellness and Prevention, Shire and Takeda, and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Dr. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. The other authors report no biomedical financial interests or potential conflicts of interest.

ENDNOTE

[1] Post hoc analyses revealed that NSSI-D was also associated with severe role impairment in daily life in the subsample without 12-month mental disorders (OR = 8.6, 95% CI = 1.7–43.5). However, due to low number of cases with NSSI-D in this subsample ($n = 7$), caution is needed in interpreting these findings.

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REFERENCES

American PsychiatricAssociation. (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. Washington, DC: American Psychiatric Press.

Ammerman, B. A., Jacobucci, R., Kleiman, E. M., Muehlenkamp, J. J., & McCloskey, M. S. (2017). Development and validation of empirically derived frequency criteria for NSSI disorder using exploratory data mining. *Psychological Assessment*, *29*, 221–231. https://doi.org/10.1037/pas0000334

Arnett, J. J. (2015). *Emerging adulthood: The winding road from the late teens through the twenties* (2nd ed.). New York, NY: Oxford University Press.

Auerbach, R. P., Alonso, J., Axinn, W. G., Cuijpers, P., Ebert, D. D., Green, J. G.,…Bruffaerts, R. (2016). Mental disorders among college students in the World Health Organization World Mental Health Surveys. *Psychological Medicine*, *46*, 2955–2970. https://doi.org/10.1017/S0033291716001665

Benjet, C., Gonzalez-Herrera, I., Castro-Silva, E., Mendez, E., Borges, G., Casanova, L., & Medina-Mora, M. E. (2017). Non-suicidal self-injury in Mexican young adults: Prevalence, associations with suicidal behavior and psychiatric disorders, and DSM-5 proposed diagnostic criteria. *Journal of Affective Disorders*, *215*, 1–8. https://doi.org/10.1016/j.jad.2017.03.025

Bentley, K. H., Cassiello-Robbins, C. F., Vittorio, L., Sauer-Zavala, S., & Barlow, D. H. (2015). The association between nonsuicidal self-injury and the emotional disorders: A meta-analytic review. *Clinical Psychology Review*, *37*, 72–88. https://doi.org/10.1016/j.cpr.2015.02.006

Bentley, K. H., Nock, M. K., & Barlow, D. H. (2014). The four-function model of nonsuicidal self-injury: Key directions for future research. *Clinical Psychological Science*, *2*, 638–656. https://doi.org/10.1177/2167702613514563

DeMartini, K. S., & Carey, K. B. (2012). Optimizing the use of the AUDIT for alcohol screening in college students. *Psychological Assessment*, *24*, 954–963. https://doi.org/10.1037/a0028519

Glenn, C. R., & Klonsky, E. D. (2013). Nonsuicidal self-injury disorder: An empirical investigation in adolescent psychiatric patients. *Journal of Clinical Child & Adolescent Psychology*, *42*, 496–507. https://doi.org/10.1080/15374416.2013.794699

Gollust, S. E., Eisenberg, D., & Golberstein, E. (2008). Prevalence and correlates of self-injury among university students. *Journal of American College Health*, *56*, 491–498.

Hamza, C. A., & Willoughby, T. (2014). A longitudinal person-centered examination of nonsuicidal self-injury among university students. *Journal of Youth and Adolescence*, *43*, 671–685. https://doi.org/10.1007/s10964-013-9991-8

Hamza, C. A., & Willoughby, T. (2016). Nonsuicidal self-injury and suicidal risk among emerging adults. *Journal of Adolescent Health*, *59*, 411–415. https://doi.org/10.1016/j.jadohealth.2016.05.019

Heinze, G. (2006). A comparative investigation of methods for logistic regression with separated or nearly separated data. *Statistics in Medicine*, *25*, 4216–4226. https://doi.org/10.1002/sim.2687

Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of Adolescent Health*, *46*, 3–10. https://doi.org/10.1016/j.jadohealth.2009.08.008

In-Albon, T., Ruf, C., & Schmid, M. (2013). Proposed diagnostic criteria for the DSM-5 of nonsuicidal self-injury in female adolescents: Diagnostic and clinical correlates. *Psychiatry Journal*, https://doi.org/10.1155/2013/159208

Joiner, T. (2005). *Why people die by suicide*. Cambridge, MA: Harvard University Press.

Kessler, R. C., Calabrese, J. R., Farley, P. A., Gruber, M. J., Jewell, M. A., Katon, W.,…Wittchen, H. U. (2013). Composite International Diagnostic Interview screening scales for DSM-IV anxiety and mood disorders. *Psychological Medicine*, *43*, 1625–1637. https://doi.org/10.1017/S0033291712002334

Kessler, R. C., Heeringa, S. G., Stein, M. B., Colpe, L. J., Fullerton, C. S., Hwang, I.,…Schoenbaum, M. (2014). Thirty-day prevalence of DSM-IV mental disorders among nondeployed soldiers in the US Army: Results from the Army Study to assess risk and resilience in servicemembers (Army STARRS). *JAMA Psychiatry*, *71*, 504–513. https://doi.org/10.1001/jamapsychiatry.2014.28

Kessler, R. C., Santiago, P. N., Colpe, L. J., Dempsey, C. L., First, M. B., Heeringa, S. G.,…Ursano, R. J. (2013). Clinical reappraisal of the Composite International Diagnostic Interview Screening Scales (CIDI-SC) in the Army Study to assess risk and resilience in servicemembers (Army STARRS). *International Journal of Methods in Psychiatric Research*, *22*, 303–321. https://doi.org/10.1002/mpr.1398

Kessler, R. C., & Üstün, T. B. (2004). The world mental health (WMH) survey initiative version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *International Journal of Methods in Psychiatric Research*, *13*, 93–118. https://doi.org/10.1002/mpr.168

Kiekens, G., Bruffaerts, R., Nock, M. K., Van de Ven, M., Witteman, C., Mortier, P.,…Claes, L. (2015). Non-suicidal self-injury among Dutch and Belgian adolescents: Personality, stress and coping. *European Psychiatry*, *30*, 743–749. https://doi.org/10.1016/j.eurpsy.2015.06.007

Kiekens, G., Claes, L., Demyttenaere, K., Auerbach, R. P., Green, J. G., Kessler, R. C.,…Bruffaerts, R. (2016). Lifetime and 12-month nonsuicidal self-injury and academic performance in college freshmen. *Suicide and Life-Threatening Behavior*, *46*, 563–576. https://doi.org/10.1111/sltb.12237

Kiekens, G., Hasking, P., Bruffaerts, R., Claes, L., Baetens, I., Boyes, M.,…Whitlock, J. (2017). What predicts ongoing nonsuicidal self-injury? A comparison between persistent and ceased self-injury in emerging adults. *The Journal of Nervous and Mental Disease*, *205*, 762–770. https://doi.org/10.1097/NMD.0000000000000726

Klonsky, E. D., Glenn, C. R., Styer, D. M., Olino, T. M., & Washburn, J. J. (2015). The functions of nonsuicidal self-injury: Converging evidence for a two-factor structure. *Child and Adolescent Psychiatry and Mental Health*, *9*, 44. https://doi.org/10.1186/s13034-015-0073-4

Latimer, S., Meade, T., & Tennant, A. (2013). Measuring engagement in deliberate self-harm behaviors: Psychometric evaluation of six scales. *BMC Psychiatry*, *13*, 4. https://doi.org/10.1186/1471-244X-13-4

Lee, S. (2006). Propensity score adjustment as a weighting scheme for volunteer panel web surveys. *Journal of Official Statistics*, *22*, 329–349.

Mahtani, S., Melvin, G. A., & Hasking, P. (2017). Shame proneness, shame coping, and functions of nonsuicidal self-injury (NSSI) among emerging adults: A developmental analysis. *Emerging Adulthood*. https://doi.org/10.1177/2167696817711350

Merikangas, K. R., & Kalaydjian, A. (2007). Magnitude and impact of comorbidity of mental disorders from epidemiologic surveys. *Current Opinion in Psychiatry*, *20*, 353–358. https://doi.org/10.1097/YCO.0b013e3281c61dc5

Mortier, P., Kiekens, G., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., Green, J. G.,…Bruffaerts, R. (2017). A risk algorithm for the persistence of suicidal thoughts and behaviors during college. *The Journal of Clinical Psychiatry*, *78*(7):e828–e836. https://doi.org/10.4088/JCP.17m11485

Muehlenkamp, J. J., Brausch, A. M., & Washburn, J. J. (2017). How much is enough? Examining frequency criteria for NSSI disorder in adolescent inpatients. *Journal of Consulting and Clinical Psychology*, *85*, 611–619. https://doi.org/10.1037/ccp0000209

Nock, M. K. (2009). Why do people hurt themselves? New insights into the nature and functions of self-injury. *Current Directions in Psychological Science*, *18*, 78–83. https://journals.sagepub.com/doi/10.1111/j.1467-8721.2009.01613.x

Nock, M. K., & Favazza, A. R. (2009). Nonsuicidal self-injury: Definition and classification. In M. K., Nock (Ed.), *Understanding nonsuicidal self-injury: Origins, assessment, and treatment* (pp. 9–18). Washington, DC: American Psychological Association.

Nock, M. K., Holmberg, E. B., Photos, V. I., & Michel, B. D. (2007). Self-Injurious thoughts and behaviors interview: Development, reliability, and validity in an adolescent sample. *Psychological Assessment*, *19*, 309–317. https://doi.org/10.1037/1040-3590.19.3.309

Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology*, *72*, 885–890. https://doi.org/10.1037/0022-006X.72.5.885

Plener, P. L., Allroggen, M., Kapusta, N. D., Brahler, E., Fegert, J. M., & Groschwitz, R. C. (2016). The prevalence of Nonsuicidal Self-Injury (NSSI) in a representative sample of the German population. *BMC Psychiatry*, *16*, 353. https://doi.org/10.1186/s12888-016-1060-x

Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption–II. *Addiction*, *88*, 791–804.

Schouten, B., Cobben, F., & Bethlehem, J. (2009). Indicators for the representativeness of survey response. *Survey Methodology*, *35*, 101–113.

Selby, E. A., Kranzler, A., Fehling, K. B., & Panza, E. (2015). Nonsuicidal self-injury disorder: The path to diagnostic validity and final obstacles. *Clinical Psychology Review*, *38*, 79–91. https://doi.org/10.1016/j.cpr.2015.03.003

Serras, A., Saules, K. K., Cranford, J. A., & Eisenberg, D. (2010). Self-injury, substance use, and associated risk factors in a multi-campus probability sample of college students. *Psychology of Addictive Behaviors*, *24*, 119–128. https://doi.org/10.1037/a0017210

Stänicke, L. I., Haavind, H., & Gullestad, S. E. (2018). How do young people understand their own self-harm? A meta-synthesis of adolescents' subjective experience of self-harm. *Adolescent Research Review*, 1–19. https://doi.org/10.1007/s40894-018-0080-9

Swannell, S. V., Martin, G. E., Page, A., Hasking, P., & St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: Systematic review, meta-analysis and meta-regression. *Suicide and Life-Threatening Behavior*, *44*, 273–303. https://doi.org/10.1111/sltb.12070

Taliaferro, L. A., & Muehlenkamp, J. J. (2015). Risk factors associated with self-injurious behavior among a national sample of undergraduate college students. *Journal of American College Health*, *63*, 40–48. https://doi.org/10.1080/07448481.2014.953166

The Leuven College Surveys (LCS). Onderzoek fortune. Retrieved September 11, 2017, from http://www.mindmates.be/page.phpid28

The WHO World Mental Health Surveys International College Student Project (WMH-ICS). Retrieved September 11, 2017, from https://www.hcp.med.harvard.edu/wmh/college_student_survey.php).

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. Jr. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*, 575–600. https://doi.org/10.1037/a0018697

Victor, S. E., Davis, T., & Klonsky, E. D. (2017). Descriptive characteristics and initial psychometric properties of the non-suicidal self-injury disorder scale. *Archives of Suicide Research*, *21*, 265–278. https://doi.org/10.1080/13811118.2016.1193078

Washburn, J. J., Potthoff, L. M., Juzwin, K. R., & Styer, D. M. (2015). Assessing DSM–5 nonsuicidal self-injury disorder in a clinical sample. *Psychological Assessment*, *27*, 31–41. https://doi.org/10.1037/pas0000021

Willoughby, T., Heffer, T., & Hamza, C. A. (2015). The link between nonsuicidal self-injury and acquired capability for suicide: A longitudinal study. *Journal of Abnormal Psychology*, *124*, 1110–1115. https://doi.org/10.1037/abn0000104

Whitlock, J., Muehlenkamp, J., & Eckenrode, J. (2008). Variation in nonsuicidal self-injury: Identification and features of latent classes in a college population of emerging adults. *Journal of Clinical Child & Adolescent Psychology*, *37*, 725–735. https://doi.org/10.1080/15374410802359734

Whitlock, J., Muehlenkamp, J., Eckenrode, J., Purington, A., Abrams, G. B., Barreira, P., & Kress, V. (2013). Nonsuicidal self-injury as a gateway to suicide in young adults. *Journal of Adolescent Health*, *52*, 486–492. https://doi.org/10.1016/j.jadohealth.2012.09.010

Whitlock, J., Muehlenkamp, J., Purington, A., Eckenrode, J., Barreira, P., Abrams, Baral,… Knox, K. (2011). Nonsuicidal self-injury in a college population: General trends and sex differences. *Journal of American College Health*, *59*, 691–698. https://doi.org/10.1080/07448481.2010.529626

Wilcox, H. C., Arria, A. M., Caldeira, K. M., Vincent, K. B., Pinchevsky, G. M., & O'Grady, K. E. (2012). Longitudinal predictors of past-year non-suicidal self-injury and motives among college students. *Psychological Medicine*, *42*, 717–726. https://doi.org/10.1017/S0033291711001814

Zetterqvist, M. (2015). The DSM-5 diagnosis of nonsuicidal self-injury disorder: A review of the empirical literature. *Child and Adolescent Psychiatry and Mental Health*, *9*, 31. https://doi.org/10.1186/s13034-015-0062-7

Zivin, K., Eisenberg, D., Gollust, S. E., & Golberstein, E. (2009). Persistence of mental health problems and needs in a college student population. *Journal of Affective Disorders*, *117*, 180–185. https://doi.org/10.1016/j.jad.2009.01.001

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