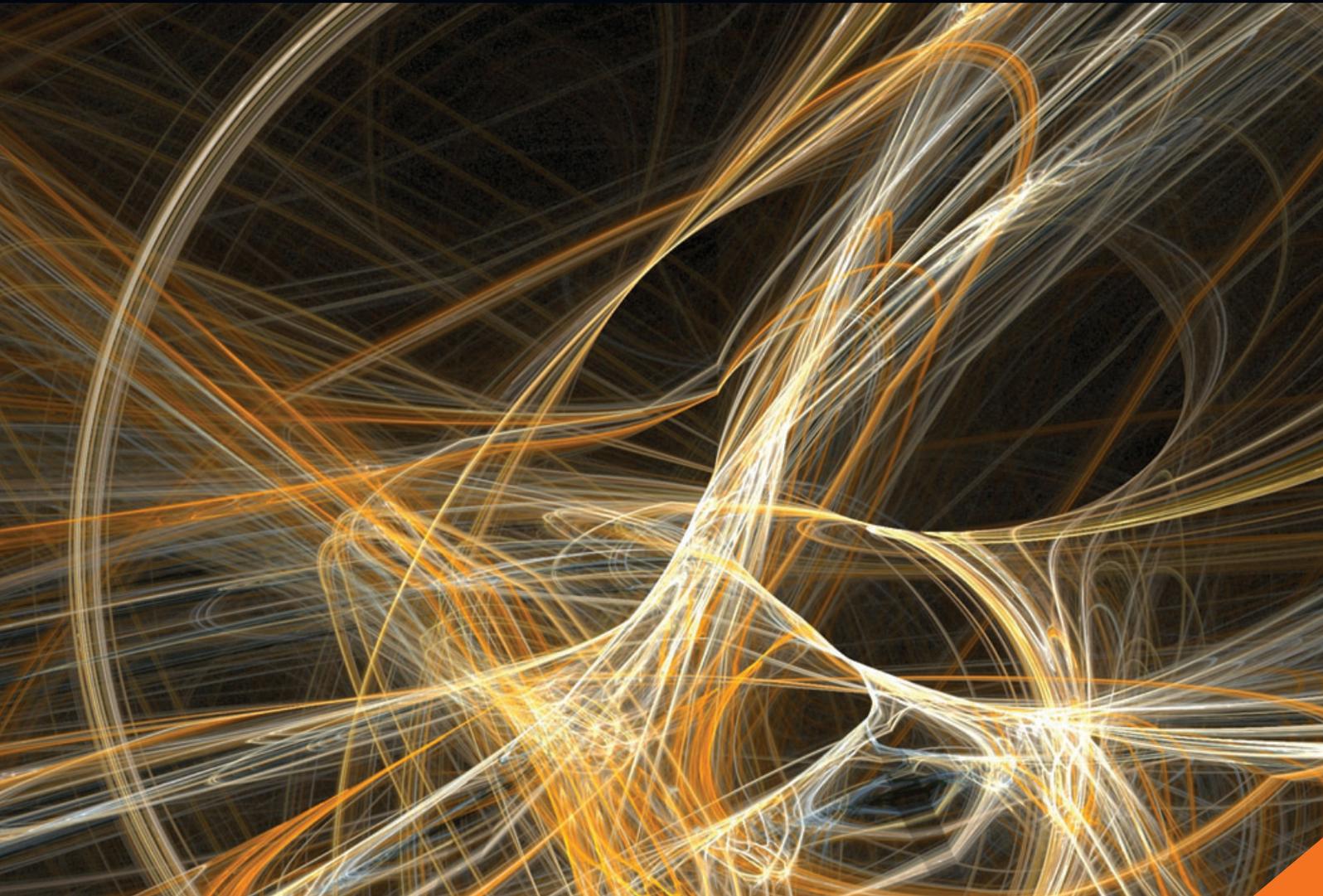


1049-8931 2019 VOL 28 NO 2

INTERNATIONAL JOURNAL OF METHODS IN
**PSYCHIATRIC
RESEARCH**



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INTERNATIONAL JOURNAL OF METHODS IN PSYCHIATRIC RESEARCH

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SPECIAL ISSUE

Introduction to the special issue: The WHO World Mental Health International College Student (WMH-ICS) initiative

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Funding information

ZonMw, Grant/Award Number: 636110005

Abstract

Most mental disorders have their first onset in early adulthood. Epidemiological research, as well as research on preventive and early interventions, is therefore very important. This thematic issue focuses on one of the first systematic attempts to develop such services for college students. The WHO World Mental Health International College Student (WMH-ICS) initiative is based on the largest and continuously growing epidemiological dataset ever collected in college students. Based on these results, the initiative has now started to implement internet-based interventions for common mental disorders and emotional problems. In this special issue, a general paper about the initiative is presented, as well as a paper on the implementation of the WMH-ICS initiative in low and middle income countries. It also includes several papers with core epidemiological results of the initiative, a meta-analysis of internet-based interventions for mental health problems in college students and the first results of trials conducted as part of the initiative. Taken together, the papers in this special issue show that WMH-ICS is on its way to becoming a major initiative in addressing the problem of unmet need for treatment of mental health problems among college students.

KEYWORDS

affective disorders, depression, effectiveness research, prevention, psychotherapy

Most mental disorders have their first onset in early adulthood (De Girolamo, McGorry, & Sartorius, 2019). Epidemiological research and research on preventive and early interventions are therefore very important. New technologies make it possible to conduct epidemiological research relatively easily through online surveys, and a growing number of randomized trials have shown that psychological interventions can be delivered effectively and efficiently through internet-

based and mobile interventions as well (Ebert et al., 2018). Colleges and universities are an excellent setting to conduct epidemiological and intervention research making use of these technologies to prevent or intervene early in mental disorders.

The WHO World Mental Health International College Student (WMH-ICS) initiative is one of the first systematic attempts to carry out these kinds of research with college students. Starting with a series of mental health needs assessment surveys initiated at KU Leuven in 2012 and growing into a coordinated series of ongoing surveys of this sort across a number of countries that are discussed in this

Information about the requirements for joining WMH-ICS can be obtained from ronkadm@hcp.med.harvard.edu

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special issue, the initiative has documented the high prevalence (Auerbach et al., 2016, 2018), substantial impairment (Alonso, Mortier et al., 2018), and consistently low receipt of treatment of mental disorders across a growing number of colleges and countries. Based on these results, the initiative has now started to implement internet-based interventions for common mental disorders and emotional problems (Harrer et al., 2018). We expect that this initiative will grow exponentially in the coming years, with more colleges across the world participating and a growing number of interventions that can be offered to students.

Because the WMH-ICS initiative has now started off with a growing number of epidemiological and intervention studies, this is the right time to publish a thematic issue with overviews of our most important early results. The papers that are part of this thematic issue provide an overview of what has been accomplished already and maps out our planned steps for the coming years.

In the first paper, Cuijpers et al. (this issue) present an overview of the goals of the WMH-ICS initiative, with a focus on the three main components: the epidemiological basis, the infrastructure for the development and testing of the internet interventions for mental health problems, and the dissemination of evidence-based interventions in participating colleges.

The initiative has also considerable potential to be implemented in low and middle income (LAMI) countries, where many college students are the first in their families to attend college. Stress can be especially high among such students but mental health treatment resources are typically quite low. In the second paper, Evans-Lacko and Thornicroft (2018) discuss the opportunities and challenges of expanding the WMH-ICS work to such settings. The authors describe the rapid increase in college attendance in LAMIs, especially in middle income countries, and why preventive and early interventions are particularly needed in these settings. Based on extensive experience attempting to improve mental health services in LMICs, Evans-Lacko and Thornicroft make it clear that challenges will exist in attempting to bring WMH-ICS to LMICs and that flexibility and long-term planning will be needed to adapt to the specific settings where the initiative will be implemented.

The next four papers focus on the initial wave of epidemiological surveys carried out in WMH-ICS, which consist of surveys in 19 colleges across eight countries that yielded information on more than 14,000 students. The first of these papers, by Auerbach et al. (2018), presents an overview of the surveys along with information about the prevalence and basic socio-demographic distributions of common mental disorders in the surveys. Auerbach and colleagues not only show that mental disorders are widely distributed across the student population but also that they commonly co-occur and that this co-occurrence may have profound implications for treatment.

The next paper, by Alonso, Vilagut, et al. (2018), documents that mental disorders are strongly associated with the role impairment experienced by students. Indeed, the data reported by Alonso et al. suggest that the majority of role impairments found among college students can be traced back to the mental disorders assessed in our surveys. The societal costs associated with failing to intervene either to prevent or to treat these disorders in a timely fashion are laid out clearly in this paper.

In the next paper, Bruffaerts et al. (this issue) investigate the receipt of treatment among college students with mental disorders. As detailed in that paper, treatment rates are consistently low across all the colleges surveyed in WMH-ICS. This is true despite the fact that the vast majority of the colleges included in these first WMH-ICS surveys have student mental health clinics where treatment is available either at low or no cost.

The reasons for this treatment gap are explored in the next paper. Ebert et al. (this issue) examine barriers to treatment reported in the surveys by students. The analysis makes it clear that psychological barriers, such as a preference to handle problems alone, are more important than practical barriers. The authors suggest that internet interventions might help resolve these barriers by providing students with a private way of obtaining treatment.

The next paper, also by Ebert and colleagues (this issue), uses an experimental design to evaluate the potential for customized feedback to increase the willingness of students who screen positive for clinically significant emotional problems to seek treatment. As detailed in the paper, promising results were found suggesting that willingness of students to seek treatment for emotional problems may indeed be increased with simple procedures such as customized feedback addressing psychological barriers to treatment. It is also noted, though, that a wide range of other options exist for improving recruitment by targeting motivational messages to the particular conditions and barriers reported by the students. Based on these results, in conjunction with the finding of high unmet need for treatment among college students in the earlier Bruffaerts et al. paper, we anticipate a long-term program of experiments along these lines to be carried out in conjunction with the annual WMH-ICS surveys.

The final two papers focus on e-health interventions. The first of these papers, by Harrer et al. (this issue), is a meta-analytic review of randomized trials involving the use of internet-based interventions for mental health problems among college students. This study shows that a considerable number of such trials have already been conducted and that the results are very encouraging regarding the potential of such interventions to treat such diverse student mental health problems as depression, anxiety, stress, eating disorder symptoms, and sleep problems.

The second intervention paper, by Kählke et al. (2018), presents the results of one of the first randomized treatment trials conducted within the context of WMH-ICS. That trial focused on social anxiety disorder, a commonly occurring and sometimes seriously impairing disorder among college students. Social anxiety disorder poses special challenges for intervention due to the fact that the symptoms of the disorder create a psychological barrier to treatment that results in only a small minority of the students who suffer from this disorder seeking treatment. The Kählke et al. intervention is unique in that it used mass email advertisements sent to students to recruit extremely shy students who otherwise would not seek treatment to receive confidential help via the internet. The advertisements informed potential subjects that they could receive confidential help via the internet that would not require them to make in-person treatment visits or, indeed, to speak to a clinician after the initial telephone intake interview. The success of this intervention illustrates the potential value of WMH-ICS in using innovative outreach and intervention delivery methods

to target important pockets of unmet need for treatment among college students with diverse emotional problems.

Taken together, the papers in this special issue show that WMH-ICS is on its way to becoming a major initiative in addressing the problem of unmet need for treatment of mental health problems among college students. The initiative has a unique combination of features that bode well for its success: ongoing needs assessment surveys, which will allow us to pinpoint areas of unmet need for treatment, monitor barriers to treatment, carry out experiments with diverse intervention recruitment strategies, implement wide-ranging internet-based interventions (and possibly subsequent in-person interventions) that will be evaluated using an effectiveness trial approach, and use evidence-based dissemination activities that will guard against intervention degradation with ongoing monitoring of both processes and outcomes. Challenges will exist, of course, in growing the initiative, but the focal population is of enormous public health importance, the level of current unmet need for treatment is high, and opportunities for intervention delivery are vast. Based on this unique combination of characteristics, we have every expectation that the initiative will provide to be valuable.

FUNDING INFORMATION

The Dutch part of this project is financially supported by ZonMw, The Netherlands Organisation for Health Research and Development (grant 636110005).

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How to cite this article: Cuijpers P, Auerbach RP, Benjet C, et al. Introduction to the special issue: The WHO World Mental Health International College Student (WMH-ICS) initiative. *Int J Methods Psychiatr Res*. 2019;28:e1762. <https://doi.org/10.1002/mpr.1762>

SPECIAL ISSUE

The World Health Organization World Mental Health International College Student initiative: An overview

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Funding information

ZonMw, Grant/Award Number: 636110005

Abstract

Objectives: The college years are a developmentally crucial period and a peak age for the onset of mental disorders.

Methods: The World Health Organization World Mental Health International College Student (WMH-ICS) initiative is aimed at developing and implementing a system for improving prevention and early interventions for mental health problems among college students.

Results: The initiative consists of three core elements. The first element is a web-based survey to assess the magnitude and nature of emotional problems, the effects of these problems on students' functioning, and barriers to seeking treatment. All first-year students in participating colleges are invited to participate, and we plan to expand the survey to all students in the future. The second element is an infrastructure to test internet-based interventions aimed at the prevention and early intervention in mental health problems. Participating colleges can develop and test internet-based interventions in randomized trials. The first pilot tests on such interventions now been done. The third element is the dissemination and continuous quality improvement monitoring of the evidence-based interventions developed in WMH-ICS.

Conclusions: By addressing these three core elements, the WMH-ICS aims to integrate epidemiological and clinical research to offer scalable and effective evidence-based interventions for mental health problems at a critical life course stage.

KEYWORDS

affective disorders, depression, early intervention, prevention, psychotherapy

1 | INTRODUCTION

The college years are a developmentally crucial period for young people in which they transition from late adolescence to emerging adulthood (Arnett, 2000). These years (typically 17 to 24) are a peak

period for the onset of mental disorders (McGorry, Purcell, Goldstone, & Amminger, 2011). There is strong evidence that mental disorders during this period can have profound negative effects on the development of college students, including long-term adverse effects on later adult labor market functioning (Goldman-Mellor et al., 2014; Niederkrotenthaler et al., 2014), relationship functioning (Kerr & Capaldi, 2011), and health (Scott et al., 2016).

Information about the requirements for joining WMH-ICS can be obtained from ronkadm@hcp.med.harvard.edu.

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Mental health problems are important predictors of dropout from college and academic performance (Auerbach et al., 2016; Bruffaerts et al., 2018). College students with mental disorders are twice as likely as other students to drop out without obtaining a degree (Hartley, 2010; Kessler, Foster, Saunders, & Stang, 1995), and a substantial proportion of the students with mental disorders who do not drop out report a negative impact on academic performance due to their emotional problems (Kernan et al., 2008). Taken together, prevention and early treatment of mental health problems in college students is a key public health priority, not only because of the impact on the lives of students and public health but also on the investment society makes in college students and the importance of college students to the future social capital of society.

Prevention and treatment of mental disorders in younger adolescents has been examined in a considerable number of intervention trials (Merry et al., 2011). This has resulted in many primary and secondary schools in high-income countries including universal preventive interventions in their curricula and school counselors often providing preventive services and treatment interventions to students. Universities and colleges (henceforth referred to as colleges), however, typically do not have such an infrastructure for prevention and early intervention of mental health problems, and there is relatively little research on such interventions in this population. At the same time, the college years are at least as important as the earlier school years from a prevention perspective. Furthermore, the greater maturity of college students than younger students increases the range of interventions that can be delivered and the ease with which they can be delivered.

The World Health Organization (WHO) World Mental Health International College Student (WMH-ICS) initiative is an international collaboration being carried out in conjunction with the WHO World Mental Health (WMH) Surveys aimed at developing an infrastructure to examine and improve the mental health of college students. This is being done by focusing on three core elements: carrying out internet-based needs assessment surveys, developing and testing internet-based interventions for the prevention and treatment of mental health problems among college students, and disseminating evidence-based interventions using a continuous quality improvement approach. In this paper, we describe the three core elements of the initiative, provide an overview of the papers in this special issue that describe early results, and outline plans for future directions.

2 | AIMS OF THE WHO WMH-ICS INITIATIVE

The main objective of the WMH-ICS initiative is to promote the mental health and well-being of college students by documenting the high prevalence and substantial societal costs of mental disorders in this segment of the population, implementing evidence-based interventions both to prevent the onset of mental disorders and to provide early treatment of such disorders when they already exist prior to matriculation and begin during the college years, and engaging in a process of continuous quality improvement in which interventions and precision targeting to students most likely to profit from them are successively refined over time. In this way, we hope to reduce the cascade of

negative educational, economic, and social outcomes of mental disorders that currently exists among college students. The initiative aims to develop a sustainable, user-friendly, electronic infrastructure for automatically assessing and monitoring mental health problems (and associated risk factors) at the college level and to offer innovative internet-based interventions for mental health promotion, prevention, and early intervention. We also aim to disseminate the interventions we find to be effective and to work with the institutions that use these interventions on a process of continuous quality improvement.

The WMH-ICS is embedded in the WHO WMH Survey Initiative (www.hcp.med.harvard.edu/wmh), the largest coordinated series of cross-national psychiatric epidemiological surveys ever undertaken. WMH surveys are ongoing but have so far been completed in 28 countries across all regions of the world with a combined sample of over 200,000 respondents. The WMH-ICS initiative is a new “branch” of this broad-based initiative that has so far launched web-based surveys in 19 colleges in eight countries across Africa, Australia, Europe, and North America and is in the process of carrying out initial controlled treatment trials involving guided internet-based cognitive behavior therapy in many of these populations. The number of participating colleges and countries in which colleges are located is likely to grow substantially over time.

3 | THE EPIDEMIOLOGICAL FOUNDATION: THE COLLEGE STUDENT SURVEYS

All first-year students in participating colleges are invited to participate in a web-based self-report health survey. The exact procedures and target groups differ across colleges, depending on possibilities, resources, and priorities of the college, but all include core questions about disorders, stresses, impairments, and treatment. Although most colleges invite only first-year students and then follow them over time in annual tracing surveys, other colleges invite all students each year. The initial mode of contact can also vary across colleges. In some colleges, an e-survey is sent to students via their student email addresses and then completed on a secure data survey platform. In other institutions, the survey is part of a standard health evaluation that is offered to all students, or alternatively, the initial survey contact may occur as part of the registration process. After inviting students to participate, initial nonrespondents are recontacted through a series of personalized reminder emails and, in some cases, phone calls. Informed consent is always obtained before administering the e-survey, and the procedures for obtaining informed consent and protecting human participants are in line with the requirements of the college's institutional review board and with national regulations about protection of personal data.

The six core disorders assessed in the surveys are major depressive disorder, mania/hypomania, generalized anxiety disorder, panic disorder, alcohol use disorder (AUD), and substance use disorder (abuse or dependence either of cannabis, cocaine, or any other street drug, or of a prescription drug either used without a prescription or used more than prescribed to get high, buzzed, or numbed out). Screening for all disorders (except AUD) is based on the Composite International Diagnostic Interview screening scales (CIDI-SC; Kessler & Ustun, 2004; Kessler et al., 2013). Additional items taken from the

CIDI are used to assess age of onset of each disorder and number of lifetime years with symptoms. The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses in the range of $AUC = 0.70\text{--}0.78$ (Kessler et al., 2013). For AUD the Alcohol Use Disorders Identification Test (AUDIT) is used (AUDIT, 2015). The AUDIT defines AUD (abuse or dependence) as corresponding to a total score of 8+ and a score of 4+ on the AUDIT dependence score, which has concordance with a clinical diagnosis in the range $AUC = 0.78\text{--}0.91$ (Reinert & Allen, 2002).

A number of WMH-ICS surveys also screen for other disorders of particular interest to investigators in individual countries, such as social phobia, attention-deficit/hyperactivity disorder, intermittent explosive disorder, and posttraumatic stress disorder. We are encouraging the expansion of these optional models in the service of maximizing the discovery potential of the ongoing surveys. An innovative method of administered a probability subset of these optional questions to balanced probability subsamples of students in each survey is being used to maximize the potential of these data (Raghunathan & Grizzle, 1995). Synthetic methods can be used to combine these data to generate estimates of the prevalence and joint associations of optionally assessed disorders with each other as well as with the core survey questions. This approach is being used increasingly in many other large-scale surveys to reduce respondent burden (National Academies of Science, Engineering, and Medicine 2016).

Apart from screening for mental disorders, the WMH-ICS surveys measure several other characteristics, including daily functioning (Sheehan, Harnett-Sheehan, & Raj, 1996), personality traits (Donnellan, Oswald, Baird, & Lucas, 2006; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993), suicidal thoughts and behaviors (Nock, Wedig, Holmberg, & Hooley, 2008), sociodemographic characteristics (e.g., gender, ethnicity, socio-economic status, relationship status), early life adversities, participation in extracurricular activities, and use of mental health care services (e.g., type of treatment, duration). Importantly, the surveys also include a core set of questions about barriers to seeking treatment for emotional problems and readiness to engage in help seeking.

Early results from the WMH-ICS surveys have been presented in a number of reports (e.g., Auerbach et al., 2018; Bruffaerts et al., 2018; Mortier et al., 2018). As noted by Auerbach et al. in this issue, more than one-third of students in the initial round of surveys screened positive for at least one lifetime disorder, and the vast majority of these students continued to be active cases in the 12 months before the survey. The disorders typically had onsets in early-middle adolescence and had high persistence, although some of the optional disorders assessed in only a subset of surveys had earlier onsets (e.g., attention-deficit/hyperactivity disorder).

The data collected in the WMH-ICS surveys not only allow estimation of mental disorder incidence and prevalence but also make it possible to examine modifiable risk factors and consequences of these disorders for role functioning (see for example Alonso et al. in this issue). And the survey data on prevalence and correlates of disorder are available for use by new colleges joining the initiative in making benchmark comparisons. This information can help inform decisions about the package of interventions individual colleges might want to put together.

In addition to documenting prevalence and correlates of disorders, the annual WMH-ICS follow-up surveys make it possible to

identify students who have increased risk of developing a mental disorder over the course of their college careers. We are currently engaged in initial analyses of these prospective data with the goal of determining if reliable individual-level prediction algorithms can be developed to pinpoint students at especially high risk of developing disorders for purposes of targeting preventive interventions. Although this work is at too early, a level of development to be featured in any of the papers presented in this special issue, this is one of our most active areas of the current investigation. Our intervention specialists are involved in interpreting these results with an eye toward determining the types of preventive interventions that might be most useful to implement based on the results of the risk targeting analyses.

4 | AN INFRASTRUCTURE FOR INTERNET-BASED INTERVENTIONS FOR MENTAL HEALTH AND RELATED PROBLEMS

The second aim of the initiative is to develop and to test internet-based programs for prevention and early interventions of mental health problems. We are also considering the potential value of subsequently implementing in-person interventions in a stepped-care approach in collaboration with local clinicians in the participating institutions, although this possibility is at a too early stage to be mentioned more than in passing. A large body of research exists showing that internet interventions are effective in the prevention and treatment of several mental health problems and that no important differences exist in the aggregate effects of guided internet interventions and face-to-face interventions. More than 20 randomized trials directly comparing guided internet-based with face-to-face interventions for several mental disorders consistently indicate no significant difference (Carlbring, Andersson, Cuijpers, Riper, & Hedman-Lagerhof, 2018; Andersson et al., 2014). For anxiety disorders, face-to-face therapy may be somewhat more effective, but the difference is small ($g = 0.20$; Haug, Nordgreen, Öst, & Havik, 2012).

However, these comparable effects for face-to-face and internet interventions are only true when the internet interventions are guided by professional therapists. If no therapist is involved, the effects of internet interventions are still significant, but considerably smaller, at least for depression (Karyotaki et al., 2016). For anxiety disorders, the difference between guided and unguided internet therapies are less clear (Haug et al., 2012). In guided interventions, the students with mental health problems are supported by qualified therapists who guide students through the intervention. These therapists mostly focus on giving feedback and providing support with working through the intervention and do not necessarily focus on developing a patient-therapist relationship as in more traditional therapies. In unguided interventions, no human support is given to the students while working through the intervention. As discussed in more detail below, we are implementing both guided and unguided interventions and studying their relative effectiveness.

Internet interventions have been found to be effective in many mental health problems aside from depression and anxiety, including sleep problems (Ye et al., 2016), alcohol problems (Sundström,

Blankers, & Khadjesari, 2017), and posttraumatic stress disorder (Sijbrandij, Kunovski, & Cuijpers, 2016). Furthermore, these interventions have been found to be effective in addressing psychological problems that are not directly diagnosed as mental disorders, but typically show strong associations with these disorders, such as procrastination (Rozental, Forsell, Svensson, Andersson, & Carlbring, 2015), perfectionism (Radhu, Daskalakis, Arpin-Cribbie, Irvine, & Ritvo, 2012), and stress management (Harrer et al., 2018). There is also some evidence that internet interventions can be used effectively in mental health promotion (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009).

Internet interventions have many advantages over traditional face-to-face interventions, as they are easily scalable to target large populations, require no travelling time for patients, have no waiting lists, and are accessible at any time per the patient's schedule (Cuijpers Query="13"/> & Schuurmans, 2007). Another advantage of internet-based interventions is that they address key barriers such as stigma (e.g., shame about attending appointment in a mental health counseling center) and avoidance (e.g., social anxiety). College students are also typically very familiar with new technologies.

An exciting feature of WMH-ICS is that the initiative will, in effect, create an infrastructure to facilitate carrying out ongoing iterative tests of internet interventions among college students based on information obtained in the survey about the most pressing areas of unmet need for treatment. The general approach will be to develop and test specific interventions in one or more randomized trials, revise, and retest the interventions as appropriate based on process evaluations, and then disseminate the interventions in a broader set of colleges once they are found to be effective. The dissemination phase will include ongoing process and outcome assessments designed to guarantee maintenance of intervention fidelity with dissemination.

At the moment, WMH-ICS trials are either currently being implemented or are being prepared for implementation in Germany, the Netherlands, Taiwan, the United States, and a number of Latin American countries. The trials include a mix of informational interventions aimed at increasing willingness to accept treatment when it is offered, preventive interventions for students who have subthreshold symptoms, and clinical interventions for students who meet full diagnostic criteria. Two of the interventions are transdiagnostic, with a focus on techniques that have been found to be effective in the treatment of anxiety and depression, such as cognitive restructuring, behavioral activation, and problem solving. Outcome measured are synchronized across the trials, so that the resulting data can be merged easily for "individual participant data" meta-analyses. The results of one of the first trials in the WMH-ICS initiative are presented in this issue (Kahlke et al., this issue).

Importantly, participating colleges also have the opportunity to develop and test their own interventions or to mix and match our growing list of WMH-ICS interventions depending on the needs documented in their surveys and their preferences for specific interventions. Several interventions along these lines are already being prepared to address problems associated with school-related stress, procrastination, sleep, and use of alcohol. We expect this catalog to grow as interventions are evaluated and found to be effective and as the rotating assessment of other problems included in the surveys

grows and documents additional problems that become targets of attention in particular schools. A wide range of additional topics (e.g., the executive dysfunction subtype of adult ADHD, binge eating, internet gambling) are already under discussion for such expanded interventions.

As noted above, internet-based interventions can be either guided or unguided. Consistent with previous research, unguided interventions are likely to be effective for a smaller proportion of students than guided interventions, but guided interventions are also more expensive to implement because they require the time of clinicians (albeit less time than needed in in-person interventions). We consequently plan to implement both unguided and guided internet interventions and to carry out research designed to increase understanding of the patient factors that determine how likely it is that each will be effective. The latter research is a particularly exciting aspect of our initiative: to estimate prescriptive treatment effectiveness models to help determine which students are most likely to respond to low-cost unguided internet interventions. These prescriptive treatment effectiveness models will be estimated using cutting-edge artificial intelligence methods implemented both in our controlled trials and in the data collected as part of quality assurance in the dissemination phase of intervention implementation (Kessler, 2018). The fact that WMH-ICS intervention dissemination will involve a large number of patients will be important in this regard, as large samples are needed to develop clinically useful prescriptive treatment effectiveness models (Luedtke, Sadikova, & Kessler, in press).

Our goal in estimating these prescriptive treatment effectiveness models will be to develop a principled basis for implementing a stepped-care treatment approach (Van Straten et al., 2015). In stepped-care, the least resource-intensive intervention likely to be effective for a given patient is offered first, and more intensive interventions are then offered if the initial intervention is not effective. In doing this, although, it is important to avoid assigning any students to an intervention that our prediction models suggest are likely not to be effective for students, as we recognize that treatment failure is not without costs, including not only the costs of the failed treatments themselves but also increased reluctance to initiate a higher step of treatment that could be effective and, in the extreme, suicidal behaviors that sometimes occur in the wake of failed treatment. It might be that our models suggest that unguided internet-based interventions might be the best initial treatments for some students, guided internet-based interventions best for other students, and referral to in-person intervention best for yet other students.

5 | DISSEMINATION OF EVIDENCE-BASED INTERNET INTERVENTIONS FOR COLLEGE STUDENTS

As noted above, the interventions developed, tested, and found to be effective in WMH-ICS trials will be disseminated to participating colleges, resulting in an increasing number of evidence-based interventions being included in our repository over time. The sophistication of our prescriptive treatment effectiveness models will grow as well to the point that we will eventually have an integrated clinical

decision support system for matching the right patients to the right interventions in order to optimize treatment effectiveness across a wide range of conditions. Furthermore, as the master dataset increases in size and interventions are implemented in routine care, the data collected in the dissemination phase of our work will allow us to evaluate whether improvements found in routine care are comparable with those in randomized trials and, if not, to investigate potentially modifiable determinants of degradation of intervention effects in dissemination.

6 | DISCUSSION

In this paper, we described the aims and general design of the WHO WMH-ICS initiative, a large cross-national multicomponent initiative aimed at developing an ongoing learning health system to improve the mental health of college students. Our hope is that the overarching goal of improving college student mental health will be achieved through an iterative process of needs assessment, intervention development and testing, and continuous quality improvement in the context of dissemination.

WMH-ICS is innovative. It integrates epidemiological, clinical, and dissemination research. It has considerable potential to improve the mental health of college students across the world both in high-income and lower-income settings. Despite the immense scope of the undertaking, it is scalable by virtue of the economies of scale that can be achieved by focusing on student populations and making use of internet technologies. Of course, there will be challenges involved with the fact that there is no worldwide funding for an initiative such as this one, which makes coordination and the actual implementation of the project complicated. This is especially the case given that granting agencies within countries may require methods and targets that do not dovetail as cleanly as we would prefer. There is also the issue that the internet interventions we are implementing need to be integrated with the face-to-face counseling and mental health treatment services available to varying degrees to students in colleges around the world. Evans-Lacko and Thornicroft, in the next chapter, discuss a number of related practical challenges that are especially likely to arise in low- and middle-income countries. However, we believe that our approach provides a critical way forward for improving mental health services for college students that can build on and extend the reach of existing services by dramatically increasing the number of students helped for fixed treatment resources and breaking down a number of the important treatment barriers that exist among college students.

Although the initiative is currently only in an early phase, a considerable number of students from participating colleges have already completed surveys, the first trials have begun, and a growing number of colleges and countries are expressing interest in joining us. It will take several years before we have evidence to document the effects of the initial interventions and several more years before dissemination activities are advanced enough to build up a rich repository of proven interventions and clinical decision support models to match the right students with the right treatments. Even in the early work described in the subsequent papers in this special issue, although,

WMH-ICS has made great strides. We have every expectation of building on these and advancing the goal of improving the mental health of college students worldwide as the initiative matures.

ACKNOWLEDGEMENT

The Dutch part of this project is financially supported by ZonMw, The Netherlands Organization for Health Research and Development (grant 636110005).

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How to cite this article: Cuijpers P, Auerbach RP, Benjet C, et al. The World Health Organization World Mental Health International College Student initiative: An overview. *Int J Methods Psychiatr Res*. 2019;28:e1761. <https://doi.org/10.1002/mpr.1761>

Viewpoint: WHO World Mental Health Surveys International College Student initiative: Implementation issues in low- and middle-income countries

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Funding information

European Union's Seventh Framework Programme, Grant/Award Number: FP7/2007-2013

Abstract

The university system and students are rapidly growing and changing in low- and middle-income countries (LMICs). This growth can facilitate enhanced national productivity yet it can also bring potential risks to student mental health. The World Mental Health Surveys International College Student (WMH-ICS) initiative could increase information and support in a relatively low-cost manner for university students in LMICs—a group that is particularly vulnerable to mental health problems and who live in an environment where few targeted resources may be available. Effective implementation of the WMH-ICS initiative, however, requires long-term planning and consideration of the specific challenges present in LMIC settings. Planning as to what types of interventions would be needed and achievable in the next 10 to 15 years and consideration of local issues related to uptake, acceptability, appropriateness, feasibility, fidelity, and sustainability from the very beginning would be needed to ensure that the initiative would be useful in the future.

KEYWORDS

adolescent psychiatry, health service, implementation science, low- and middle-income countries, public mental health

1 | INTRODUCTION

Mental health problems, in particular depression and anxiety, are as or more prevalent among university students compared with the general population (Auerbach et al., 2018; Ibrahim, Kelly, Adams, & Glazebrook, 2013). Transitioning to a new environment at university can provide not only increased opportunities for independence but also less structured time with greater potential to engage in risky behaviours, often while living far away from family and friends. These new and sometimes challenging circumstances emerge alongside increased pressures for academic achievement, all of which can contribute to a higher risk for mental health problems.

For students from low- and middle-income countries (LMICs), these adjustments and pressures may be particularly severe given that so many of these students come from families in which neither of their

parents attended university and in which pressures on the students are great to help elevate the socio-economic positions of their entire families. And all this occurs in the context of the human and financial resources to support students in LMICs being highly constrained (Oppong Asante & Andoh-Arthur, 2015; Shamsuddin et al., 2013). Given the potential impact of mental health problems on academic achievement and hence future life opportunities of these students, and the critical importance of nurturing a generation of university graduates for societal development, it is critical to understand how young people in LMICs can be supported so that their mental health problems do not undermine their educational attainment. Mental health related risk and protective factors, effective intervention strategies, and how best to implement them for university students in LMICs are all under-researched issues. The aim of this viewpoint paper is to consider key questions related to the implementation of evidence for this target group.

2 | CURRENT TRENDS IN HIGHER EDUCATION IN LMICs

The number of universities and university students has been steadily increasing worldwide, but this growth has been particularly great in many LMICs (Mullan et al., 2011). Between 2000 and 2016, for example, the proportion of adults enrolled in tertiary education increased 122% in low-income countries (from 3.4% to 7.5%) and by 195% in upper middle-income countries (from 17.2% to 50.7%; UNESCO Institute for Statistics, 2017). Indeed, in China, the increase in university students was over 500% during this time period. High-income countries already have a much greater proportion of individuals enrolled in tertiary education compared with LMICs and showed a smaller increase of only of 33% between 2000 and 2016 (from 56.4% to 75% of young people; UNESCO Institute for Statistics, 2017; see Figure 1).

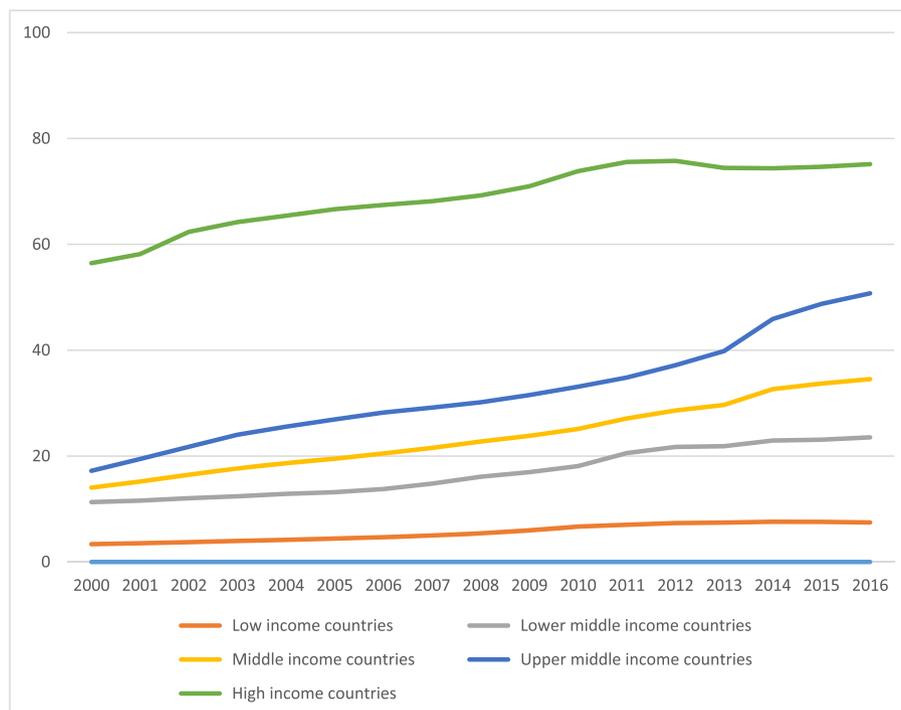
These enrolment figures are likely to continue growing given the prominence of higher education in the United Nations Sustainable Development Goals and in particular target 4.3, which focuses on increasing equitable access to tertiary education, including university (United Nations, 2015). The push for university expansion in LMICs may well also lead to changes in the types of students attending university in these countries (Schendel & McCowan, 2016). Although university education in LMICs was traditionally limited to a relatively small sector of elite families, it is anticipated that the expansion will lead to universities enrolling more students from socio-economically deprived backgrounds in addition to higher numbers of women (Schendel & McCowan, 2016). This increased diversity at the

university level in LMICs could have important consequences in terms of increasing equity in future leadership roles.

3 | MENTAL HEALTH CONSEQUENCES OF UNIVERSITIES IN TRANSITION IN LMICs

Although such growth in the knowledge economy is undoubtedly a positive consequence of higher education expansion, the increased pressures on students and families associated with this transition can also increase vulnerability to mental health problems. Students from socio-economically deprived backgrounds, in particular, are likely to have lower levels of preparation from primary and secondary school education, lower levels of financial resources, and a more limited social support network with knowledge of the skills needed to negotiate the demands of university life (Ibrahim, Kelly, & Glazebrook, 2012; Shamsuddin et al., 2013). Moreover, given the investment made by these individuals and families to attend university, the pressures under which students are operating to manifestly succeed may be intense. These conditions can make maintaining good mental health difficult because of the perceived stakes whereby obtaining a degree could secure the long-term financial viability of the student and family, while the penalty of failure could have serious negative social and economic impacts. Under these circumstances, students who do develop mental illness may be reluctant to disclose this to their family, or to seek help if this may not be done confidentially.

There is a body of literature, mostly from high-income countries, which demonstrates the particular challenges faced by individuals



Source: UNESCO Institute for Statistics. (2017). UNESCO Institute for Statistics. Retrieved from <http://data.uis.unesco.org/index.aspx?queryid=142&lang=en>

FIGURE 1 Percentage of adults enrolled in tertiary education since 2000 by World Bank country income classification

who are the “first in their family” to attend university (Brosnan et al., 2016; Southgate et al., 2017). These students may experience some similar challenges to students from LMICs around financial stress and lack of practical support from their family. This literature argues that these students may need additional support at university to be able to successfully complete their education. Most universities in LMICs, however, are ill equipped to deal with mental health challenges and faculty are often already fully stretched and have limited training about how to provide social or emotional support to students (Hakim et al., 2018; Mullan et al., 2011).

4 | HOW CAN THE WORLD MENTAL HEALTH SURVEYS INTERNATIONAL COLLEGE STUDENT (WHO WMH-ICS) INITIATIVE RESULTS BENEFIT STUDENTS WITH MENTAL HEALTH PROBLEMS IN LMICs?

Effective interventions exist for mental health promotion, prevention, and early intervention (Harrer et al., 2018), which can enormously improve outcomes for young people and hence alter trajectories in a way that lead to immediate as well as longer term benefits (Das et al., 2016; Davies, Morriss, & Glazebrook, 2014; Regehr, Glancy, & Pitts, 2013; Sandler et al., 2014). The WHO WMH-ICS (Cuijpers, Ebert, Auerbach, Bruffaerts, & Karyotaki, 2018) provides an infrastructure to deliver evidence-based, internet-delivered interventions for mental health that are inexpensive and scalable. This platform uses a stepped-care approach and also allows for monitoring of mental health and associated risk and protective factors over time alongside the intervention. The data collected from participants could therefore allow for stratifying the interventions based on which types of intervention demonstrate the greatest effectiveness for specific individuals or student groups, including those with less social or financial support.

The WHO WMH-ICS also has potential to provide new evidence on how to improve access to effective interventions in order to improve mental health among university students in LMICs. The intervention is relatively low cost to the user—mainly relying on access to a mobile device and internet connectivity with relatively inexpensive coaching provided by trained laypersons. This means that the interventions will not require a high degree of specialised training or burden the health care workforce available in most LMICs. If the intervention did lead to greater recognition of mental health problems and increased help-seeking, this could result in increased costs to the health and education sectors in the short term. However, appropriate intervention could also positively impact upon educational achievement and societal costs in the long term. The WHO WMH-ICS interventions could also increase earlier access to support and reduce the stigma related barriers to accessing support (Clement et al., 2013; Semrau, Evans-Lacko, Koschorke, Ashenafi, & Thornicroft, 2014) as the individual would not have to visit a mental health service and disclose their problems in person. This possible increase in the proportion of individuals with mental disorders who receive timely treatment has the potential not only to reduce the duration of untreated mental

illness but also could have a positive impact on treatment effectiveness and reduce subsequent disorder persistence and severity.

5 | IMPLEMENTATION CHALLENGES OF THE WHO WMH-ICS IN LMICs

There are clearly potential benefits which could result from implementing the WHO WMH-ICS in LMICs. At a minimum, implementation in LMICs would allow collection of data about the feasibility and effectiveness of e-health intervention in LMIC contexts, where robust data are often limited (Das et al., 2016). The resulting impacts, however, would rely on effective implementation and uptake of the programme and recognition of the particular challenges that exist in LMICs. Indeed, the interventions are still at an early pilot stage, and evidence of feasibility, uptake, and effectiveness is still needed.

The WHO WMH-ICS is currently being field tested. Although this is mainly being done in a selected number of high-income countries, there are also data available from upper middle-income countries: South Africa and Mexico (Auerbach et al., 2018; Benjet et al., in press; Mall et al., 2018; Mortier et al., 2018). Thus, even if intervention effectiveness were established in the pilot countries, this would not address whether and how the intervention works in other LMIC contexts. Additionally, the incentives for universities to participate in high-income countries might not translate to LMIC settings. Given that few young people attend universities in LMICs, it may also be helpful to broaden the target group in LMIC contexts (including low-income contexts) and consider other settings or training and apprenticeship programmes which are more commonly attended by young people in LMICs.

Additionally, given several key implementation issues require consideration. There is substantial heterogeneity between and within sites and attention needs to be taken to consider how to specifically adapt the WHO WMH-ICS for participating LMICs sites or countries from the initial planning stages. First, although the programme would provide support for individuals to self-manage their problems, a subset of those with more severe problems would require more intensive treatment, for example, from a specialist and appropriate referral systems would need to be put in place for this (Keynejad, Dua, Barbui, & Thornicroft, 2017). Given the lack of professional health care staff in LMICs, this would likely require additional effort to identify resources already available in that community. It may also need closer collaboration with health care professionals in that setting given that the intervention could increase demand for mental health treatment where the resources are limited. The university might also experience increased demands for support and given the likely pressures to expand quickly, careful discussions may be needed to make a case as to why they might invest in the WHO WMH-ICS and divert limited resources from competing demands. The educational and economic advantages of student support need to be made clear to senior management at universities to support their decisions to invest in student mental health services. To this end, it is important for the initial waves of WMH-ICS surveys to determine the strength of associations between mental disorders and subsequent school performance among students in LMICs.

In addition to such service supply side issues impacting on limited university or community resources, there would be another set of

contextual factors, which would require consideration for tailoring and adaptation to the country and/or university context. There are likely to be legal, ethical, technical, and cultural issues that may influence engagement, uptake, and even effectiveness of the intervention in different contexts. At the legal or regulatory level, there are likely differences in consent procedures and privacy policies, which would need to be addressed, for example, consideration of when, if at all, parents of students with mental illness would be informed of the condition. Students in some countries may also be less familiar with research and thus would require detailed explanation about the meaning of the trial and implications of their participation. Some religious beliefs and cultural values may also conflict with traditional therapeutic approaches (Scorzelli & Reinke-Scorzelli, 1994; Shefer et al., 2013) and thus require adaptation to facilitate engagement and effectiveness (Bhugra & Bhui, 2006; Lewer, O'Reilly, Mojtabai, & Evans-Lacko, 2015; Moodley & Palmer, 2014). Finally, limited internet connectivity in some countries may require a platform with a lower bandwidth. Although the mobile health platform may mitigate stigma and privacy barriers to uptake, local factors to facilitate engagement should be considered given that it is largely a self-management tool. The possibility might be considered, for example, of expanding the existing coaching aspects of the guided versions of the e-interventions used in WMH-ICS to include, that is, blended interventions, that is, combinations of internet and face-to-face interventions (Erbe, Eichert, Riper, & Ebert, 2017) and including, for example, social skills training related to the special demands of student life.

6 | CONCLUSIONS

The WHO WMH-ICS initiative is an exciting undertaking by virtue of the fact that it has potential to increase information and support for university students in LMICs—a group that is particularly vulnerable to mental health problems and who live in an environment where few targeted resources may be available. Moreover, data gathered from the WHO WMH-ICS platform could help to distinguish key target groups that could benefit from interventions offered by the initiative and to identify ways of optimising the effects of these interventions in areas with limited data and resources for research. Achieving these targets requires long-term planning considering implementation factors such as uptake, acceptability, appropriateness, feasibility, fidelity, and sustainability (Peters, Adam, Alonge, Agyepong, & Tran, 2013) from the very beginning in order to ensure that the programme is useful in the future.

Implementation and testing in LMICs will require recognition of the specific challenges present in those settings based on currently available evidence, but also planning as to what types of interventions are most needed and would be achievable over a time horizon of 10 to 15 years. It may be useful to consider how a “whole school” approach, which has been shown to be cost-effective in secondary school settings in LMICs, could be integrated (Patel, 2018). Given the rapid expansion and changing demographics of universities in LMICs, the programme will need to plan for new types of users, circumstances, and potentially different types of mental health problems and changes in mental health resources available. These issues will need to be kept

in mind right from the beginning and will require concerted collaboration with university structures and individuals working at the top, middle management, and ground levels to understand relevant policies and practices and ensure that people are on board to ensure the sustainability of this promising programme.

ACKNOWLEDGEMENTS

We would also like to thank Professors Vikram Patel, Ron Kessler, Corina Benjet, and Pim Cuijpers and Drs David Ebert and Randy Auerbach for their helpful feedback on the paper. GT is supported by the Medical Research Council and the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South London at King's College London NHS Foundation Trust, and the NIHR Asset Global Health Unit award. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care. S. E. L. is supported by the European Research Council under the European Union's Seventh Framework Programme (FP7/2007-2013)/ERC grant agreement (337673), Medical Research Council, Economic and Social Research Council, and Global Challenges Research Fund.

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How to cite this article: Evans-Lacko S, Thornicroft G. Viewpoint: WHO World Mental Health Surveys International College Student initiative: Implementation issues in low- and middle-income countries. *Int J Methods Psychiatr Res*. 2019; 28:e1756. <https://doi.org/10.1002/mpr.1756>

Mental disorder comorbidity and suicidal thoughts and behaviors in the World Health Organization World Mental Health Surveys International College Student initiative

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Funding information

National Institute of Mental Health, Grant/Award Numbers: R56MH109566 and R01MH070884; Fogarty International Center, Grant/Award Number: FIRCA R03-TW006481; U.S. Public Health Service, Grant/Award Numbers: R01 DA016558, R01-MH069864 and R13-MH066849; Consejo Nacional de Ciencia y Tecnología (CONACyT), Grant/Award Number: CB-2016-01-285548; FPU, Grant/Award Number: FPU15/05728; DIUE Generalitat de Catalunya, Grant/Award Number: 2017 SGR 452; PNSD, Grant/Award Number: 2015I015; Instituto de Salud Carlos III-FEDER, Grant/Award Numbers: PI13/00506, CD12/00440, CM14/00125 and

Abstract

Objectives: Comorbidity is a common feature of mental disorders. However, needs assessment surveys focus largely on individual disorders rather than on comorbidity even though the latter is more important for predicting suicidal thoughts and behaviors. In the current report, we take a step beyond this conventional approach by presenting data on the prevalence and correlates (sociodemographic factors, college-related factors, and suicidal thoughts and behaviors) of the main multivariate profiles of common comorbid *Diagnostic and Statistical Manual of Mental Disorders* (DSM)-IV disorders among students participating in the first phase of the World Health Organization World Mental Health International College Student initiative.

Method: A web-based mental health survey was administered to first year students in 19 colleges across eight countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, United States; 45.5% pooled response rate) to screen for seven common DSM-IV mental disorders: major depression, mania/hypomania,

PI13/00343; Netherlands Organisation for Health Research and Development, Grant/Award Number: 636110005; Eli Lilly, Grant/Award Number: IIT-H6U-BX-I002; King Baudouin Foundation, Grant/Award Number: 2014-J2140150-102905; Belgian Fund for Scientific Research, Grant/Award Numbers: 1114717N, 11N0516N and 11N0514N

generalized anxiety disorder, panic disorder, attention-deficit/hyperactivity disorder, alcohol use disorder, and drug use disorder. We focus on the 14,348 respondents who provided complete data; 38.4% screened positive for at least one 12-month disorder.

Results: Multivariate disorder profiles were detected using latent class analysis (LCA). The least common class (C1; 1.9% of students) was made up of students with high comorbidity (four or more disorders, the majority including mania/hypomania). The remaining 12-month cases had profiles of internalizing–externalizing comorbidity (C2; 5.8%), internalizing comorbidity (C3; 14.6%), and pure disorders (C4; 16.1%). The 1.9% of students in C1 had much higher prevalence of suicidal thoughts and behaviors than other students. Specifically, 15.4% of students in C1 made a suicide attempt in the 12 months before the survey compared with 1.3–2.6% of students with disorders in C2–4, 0.2% of students with lifetime disorders but no 12-month disorders (C5), and 0.1% of students with no lifetime disorders (C6).

Conclusions: In line with prior research, comorbid mental disorders were common; however, sociodemographic correlates of LCA profiles were modest. The high level of comorbidity underscores the need to develop and test transdiagnostic approaches for treatment in college students.

KEYWORDS

college student mental health, comorbidity, mental disorders, suicide thoughts and behaviors

1 | INTRODUCTION

Recent cross-national studies show that approximately one third of college students report mental disorders in the past 12 months (Auerbach et al., 2016; Auerbach et al., 2018). The occurrence of mental disorders during this critical period of development has profound consequences on academic outcomes (college attrition—Auerbach et al., 2016; grades—Bruffaerts et al., 2018), role impairment (e.g., dysfunctional relationships and inability to work or attend class; Alonso et al., 2018), and the occurrence of suicidal thoughts and behaviors (STBs; Mortier et al., 2017). Despite recent attention and awareness about the alarming rates of mental disorders among college students (Blanco et al., 2008; Cho et al., 2015; Eisenberg, Golberstein, & Gollust, 2007; Hunt & Eisenberg, 2010; Kendler, Myers, & Dick, 2015; Mojtabai et al., 2015), less research has focused on clarifying patterns of comorbidity (Eisenberg, Hunt, & Speer, 2013). Addressing this issue is essential given that most mental disorders do not emerge in isolation (Kessler, Chiu, Demler, Merikangas, & Walters, 2005), and perhaps more importantly, college campuses must determine how best to provide appropriate intervention services for students with diverse profiles of mental disorder comorbidity.

Decades of psychiatric research across age groups have shown that comorbidity is the rule rather than the exception with comorbidity rates as high as 79% (Kessler et al., 1994; Kessler, Chiu, et al., 2005). Although it is unequivocal that mental disorders are highly comorbid, a critical question that remains in college students is whether specific patterns of disorders cooccur. Identifying mental disorder risk profiles is an essential next step for research in this population segment, as colleges are quickly pivoting from *identifying*

widespread disorders to *intervening* (e.g., Harrer et al., 2018). Somewhat paradoxically, most approaches to treatment hinge on a singular diagnosis (e.g., presence of depression or anxiety), but given that comorbidity is commonplace, developing transdiagnostic interventions that target specific profiles may prove crucial in curbing escalating rates of mental disorders (Auerbach et al., 2016; Auerbach et al., 2018) and STBs (Mortier, Cuijpers et al., 2018) in college students.

The current report includes data from the first phase of the World Health Organization (WHO) World Mental Health International College Student (WMH-ICS) initiative in which baseline surveys were completed by first year college students from 19 colleges across eight countries. In prior publications, we detailed the lifetime and 12-month prevalence of mental disorders (Auerbach et al., 2018) and STBs (Mortier et al., 2018) and, more recently, highlighted role impairment associated with internalizing and externalizing mental disorders (Alonso et al., 2018). Building on this research, our current aim was to assess 12-month psychiatric comorbidity by using a latent class analytic approach. In doing so, the goal was to identify multivariate disorder risk profiles (i.e., clarify patterns of cooccurring disorders) and, then, test whether these profiles were associated with sociodemographic and college-related factors and 12-month STBs.

2 | METHOD

2.1 | Samples

The first wave of WMH-ICS surveys was administered to first year students in a convenience sample of 19 colleges and universities

TABLE 1 World Mental Health International College Student sample characteristics

Country	Number of participating universities	Total size of the universities	Number of incoming freshmen eligible	Number of incoming freshmen participated	Response rate (%)	Survey field dates	Sampling and procedures
Australia	One public	~45,000	9,042	633	7.0	2016	All incoming freshmen were invited to participate through email. Five reminder emails were sent with personalized links to the survey. Conditional incentives were applied (movie passes).
Belgium	One public	~40,000	8,530	4,580	53.7	2014–2016	All incoming freshmen were invited for a psycho-medical check-up in the student mental health center. Surveys were completed in the waiting room. Students who did not show up for the psycho-medical check-up received up to eight reminder emails. Conditional incentives were applied (store credit coupons).
Germany	One public	~40,000	5,064	677	13.4	2016–2017	All incoming freshmen were invited to participate through email. Six reminder emails were sent with personalized links to the survey. Conditional incentives were applied (store credit coupons).
Mexico	Four private/two public	~28,000	5,293	4,199	79.3	2016	All incoming freshmen were eligible for the survey. Initial contact differed by university: survey included in an obligatory health evaluation (one university), as part of obligatory group tutoring sessions (one university), or as part of required classes (two universities) or teacher evaluations (two universities). Two universities sent reminder emails (tutors sent out emails to their tutees; in a required class of personal development, reminders were sent out by faculty). No incentives were applied.
Northern Ireland	One public	~25,000	4,359	739	17.0	2015	All incoming freshmen due to register were invited to participate. Following registration, ID numbers and links to the survey were provided. Five reminder emails/text messages were sent with personalized links to the survey. A sixth reminder involved a researcher telephoning nonresponders. All responders were entered into a number of draws to win an iPad.
South Africa	One public	~30,000	5,338	686	12.9	2015	All incoming freshmen were invited to participate through email. Eight reminder emails and one text message were sent with personalized links to the survey. Conditional incentives were applied (5× R1000 draw).
Spain	Five public	~96,000	16,332	2,118	13.0	2014–2015	All incoming freshmen were eligible for the survey. Initial contact differed by university (information stands, information sessions in classrooms, through the university's website). Four reminder emails were sent with personalized links to the survey. Conditional monetary incentives were applied. Additionally, an end-game strategy was implemented by selecting a random proportion of nonrespondents and offering all of them a monetary incentive.
United States	Three private	~21,800	4,382	739	16.9	2015–2016	All incoming freshmen were invited to participate through email. Three reminder emails were sent with personalized links to the survey. Conditional incentives were applied (gift cards).
Total	12 public/seven private	~326,000	58,340	14,371	45.5*	2014–2017	

*Indicates the weighted response rate.

(henceforth referred to as “colleges”) in eight middle- to high-income countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Procedures for obtaining informed consent and protecting human participants were approved and monitored for compliance by the institutional review boards of the organizations coordinating the surveys in each country. Details about ethics approval for the WHO WMH-ICS Initiative countries is available in this link: http://www.hcp.med.harvard.edu/wmh/ftpd/IRB_EthicsApproval_WMH-ICS.pdf. Web-based self-administered questionnaires (SAQs) were administered to incoming first year students in each participating college (seven private and 12 public) between October 2014 and February 2017 (see Table 1).

As noted in a prior report on this survey (Auerbach et al., 2018), 14,371 SAQs were completed, with sample sizes ranging from a low of 633 in Australia to a high of 4,580 in Belgium and response rates ranging from a low of 7.0% in Australia to a high of 79.3% in Mexico. The weighted (by achieved sample size) mean response rate across all surveys was 45.5%. The analyses reported here are based on the 14,348 respondents for whom poststratification weights could be computed.

2.2 | Procedures

All incoming first year students in the participating colleges were invited to participate in the web-based self-report health survey. Mode of contact varied widely across colleges, but in all cases, other than in Mexico, it consisted of an approach that attempted to recruit 100% of incoming first year students either as part of a health evaluation, as part of the registration process, or in a stand-alone survey administered to students via their student email addresses. Contact with initial nonrespondents were then made through a series of personalized reminder emails. Incentives such as a raffle for store credit coupons or movie passes were used in the final stages of recruitment in 10 of these colleges. An additional “end-game” strategy was used in Spain by selecting a random sample of nonrespondents at the end of the normal recruitment period to receive a financial incentive for one last chance at participation, with respondents recruited at that final phase given a weight equal to the inverse of their probability of selection to adjust for the undersampling of these hard-to-recruit students. The sampling scheme was quite different in Mexico, where 100% of entering first year students were invited to participate in the survey in conjunction with mandatory activities that varied from college to college, such as student health evaluations and tutoring sessions, with time set aside in these sessions for completing the surveys via computers or tablets handed out to students attending the sessions. No follow up of nonrespondents was carried out in Mexico because it was felt that students who failed to complete the survey when time was set aside for it during mandatory activities were firm nonrespondents. Informed consent was obtained before administering the SAQs in all countries. The text statement used to obtain informed consent varied across schools and was approved by the institutional review boards of the organizations coordinating the surveys in each country.

2.3 | Measures

The SAQ was developed in English and translated into local languages using a translation, back-translation, and harmonization protocol that expanded on the standard WHO protocol using methods developed by cross-national survey methodologists to maximize cross-national equivalence of meaning and consistency of measurement (Harkness et al., 2008).

2.3.1 | Mental disorders

The SAQ included short validated self-report screening scales for lifetime and 12-month prevalence of seven common *Diagnostic and Statistical Manual of Mental Disorders* (DSM)-IV mental disorders. These included four internalizing disorders (major depressive episode, mania/hypomania, generalized anxiety disorder, and panic disorder) and three externalizing disorders (attention-deficit/hyperactivity disorder, alcohol abuse or dependence, and drug abuse or dependence involving either cannabis, cocaine, any other street drug, or a prescription drug either used without a prescription or used more than prescribed to get high, buzzed, or numbed out). This is a larger set of disorders than used in previous college mental health surveys, most of which either focused only on depression (for a review, see Ibrahim, Kelly, Adams, & Glazebrook, 2013) or included only screening scales of current anxious and depressive symptoms (Mahmoud, Staten, Hall, & Lennie, 2012). Although a larger set of disorders is used in the face-to-face WMH surveys (Scott, Jonge, Stein, & Kessler, 2018), the need for a brief measure prevented the administration of student surveys that would be long enough to include all those disorders. The seven disorders in the core WMH-ICS surveys were a compromise that included the disorders associated with the highest levels of role impairment among college students in the WMH surveys (Auerbach et al., 2016). As an indication of the coverage of these disorders, 83% (unweighted) of the college students in the WMH surveys who reported suicidal ideation in the 12 months before interview met criteria for one or more of these seven disorders during that same time period.

The assessments of five of the seven disorders were based on the Composite International Diagnostic Interview Screening Scales (CIDI-SC; Kessler et al., 2013; Kessler & Ustun, 2004). The exceptions were the screen for alcohol use disorder, which was based on the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), and the screen for attention-deficit hyperactivity disorder (ADHD), which was based on DSM-IV version of the WHO Adult ADHD Self-Report Scale (Kessler et al., 2005). The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses based on the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1994), with area under the curve (AUC) in the range 0.70–0.78 (Kessler et al., 2013; Kessler, Calabrese, et al., 2013). However, validation studies have not yet been carried out in samples of college students. The version of the AUDIT we used, which defined alcohol use disorder as either a total score of 16+ or a score 8–15 with 4+ on the AUDIT dependence questions (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), has been shown to have concordance with clinical diagnoses in the range AUC = 0.78–0.91 (Reinert & Allen, 2002). Additional

items taken from the CIDI (Kessler & Ustun, 2004) were used to assess age-of-onset of each disorder and number of lifetime years with symptoms. The DSM-IV version of the WHO Adult ADHD Self-Report Scale was found to have good concordance with blinded clinical diagnoses based on a standard research diagnostic interview for adult ADHD in two separate clinical studies (Kessler, Adler, et al., 2005; Kessler et al., 2007).

In addition to assessing lifetime prevalence of all the above disorders other than ADHD, brief screening assessments were made for lifetime prevalence of binge-eating disorder, intermittent explosive disorder, and post-traumatic stress disorder. A more thorough assessment would have also asked about 12-month prevalence of these disorders but that was not done in this initial round of the WMH-ICS surveys. This omission has been corrected in the more recent version of the survey that is currently being administered. For the purposes of the analyses reported here, these disorders were coded as lifetime but not 12-month disorders even though it is almost certainly the case that at least some of these disorders were active in the 12 months before interview. The inclusion of these disorders in the current analysis accounts for discrepancies in the proportion of students who are estimated to have lifetime disorders compared with the proportion presented in an earlier report (Auerbach et al., 2018).

2.3.2 | Suicidal thoughts and behaviors

As described in an earlier report from this survey (Mortier, Auerbach, et al., 2018), a modified version of the Columbia Suicidal Severity Rating Scale (Posner et al., 2011) was used to assess STBs, including suicidal ideation and suicide attempts (SA). In addition to lifetime prevalence, respondents were asked about number of months in the past 12 months with suicide ideation (SI) and about presence of a SA in the past 12 months.

2.3.3 | Sociodemographic correlates

Several basic sociodemographic variables were included in the survey. Gender was assessed by asking respondents whether they identified themselves as male, female, transgender (male-to-female, female-to-male), or "other." Respondent age was divided into four categories (16–18, 19, 20–21, 22 or more years old). Parental educational level was assessed for father and mother separately (none, elementary, secondary, some postsecondary, college graduate, and doctoral degree) and was categorized into high (college graduate or more), medium (some postsecondary education), and low (secondary school or less) based on the higher-of-both parents' educational level. Parental marital status was dichotomized into "parents married and both alive" versus "parents either not married or at least one deceased." Respondents were asked about the urbanicity of the place they were raised (large city, small city, town or village, suburbs, and rural area) and their religious background (categorized into Christian, other religion, and no religion). Sexual orientation was classified into heterosexual, gay or lesbian, bisexual, asexual, not sure, and other. Additional questions were asked about the extent to which respondents were attracted to men and women and the gender(s) of people they had sex with (if any) in the past 5 years.

Respondents were categorized into the following categories: heterosexual with no same-sex attraction, heterosexual with same-sex attraction, nonheterosexual without same-sex sexual intercourse, and nonheterosexual with same-sex sexual intercourse.

2.3.4 | College-related correlates

Respondents were asked where they ranked academically compared with other students at the time of their high school graduation (from top 5% to bottom 10%; categorized into quartiles) and what their most important reason was to go to university. Based on the results of a tetrachoric factor analysis reported elsewhere (Auerbach et al., 2018), respondents were classified into those whose most important reasons to go to university were extrinsic (i.e., family wanted me to, my friends were going, teachers advised me to, and did not want to get a job right away) versus intrinsic (to achieve a degree, I enjoy learning and studying, to study a subject that really interests me, to improve job prospects generally, and to train for specific type of job). Respondents were also asked where they were living during the first semester of the academic year (parents', other relative's, or own home, college hall of residence, shared house, apartment, or flat/private hall of residence, and other), and if they expected to work during the school year.

2.4 | Analysis methods

2.4.1 | Weighting

We noted above that an "end-game" strategy was used in Spain in which a random sample of nonrespondents at the end of the normal recruitment period was offered a financial incentive for participation. Respondents in this end-phase were given a weight equal to $1/p$, where p represented the proportion of nonrespondents at the end of the normal recruitment period included in the end-game, to adjust for the undersampling of these hard-to-recruit respondents. In addition, in an effort to make the WMH-ICS sample in each college as representative as possible of all first year students, the surveys were poststratified by weighting the data to adjust for differences between survey respondents and nonrespondents on sociodemographic information made available about the student body by college officials. Standard methods for poststratification weighting were used for this purpose (Groves & Couper, 1998). In the case of the Spanish survey, this meant that the data were doubly weighted, one to include the end-game weight and then with the poststratification weight applied to those weighted data. Each country was given an equal sum of weights, with the total sum of weights across countries set at 14,348.

Item-level missing data in the completed surveys were imputed using the method of multiple imputation by chained equations (van Buuren, 2012). Four kinds of item-missing data were imputed simultaneously in this way. The first was a 50% random subsampling of the drug use section to reduce interview length in Belgium. The second was the complete absence of the panic disorder section due to a skip logic error in Mexico, Northern Ireland, and South Africa. The third was the complete absence of some sociodemographic variables in various colleges (sexual orientation, current living situation,

expected student job, and most important reason for going to college in Australia, Belgium, and South Africa; parent education and marital status in Australia and Belgium; religion in Australia; and self-reported high school ranking in Belgium) because of a decision not to assess those variables. The fourth was item-level skips or invalid responses to individual questions throughout the survey. The latter was less than 0.1% for lifetime disorders, 0.0–2.3% for 12-month disorders other than AUD, and in the range 3.0–9.3% (3.8–7.0% interquartile range) for AUD, 0.0–12.0% (interquartile range 1.9–2.7%) for disorder age-of-onset, 0.0–24.6% (interquartile range 2.4–8.8%) for disorder persistence, 1.8–25.4% (interquartile range 8.8–24.1%) for most important reasons for attending college, 1.0–10.8% (interquartile range 3.0–3.4%) for high school ranking, and 0.0–7.0% for the other sociodemographic and college-related variables.

2.4.2 | Substantive analyses

Latent class analysis (LCA; Magidson & Vermunt, 2004) was used to examine multivariate profiles among the seven 12-month DSM-IV disorders. Mplus software was used to estimate the models (Muthén & Muthén, 2012). LCA is a person-centered approach to define associations among discrete variables. LCA assumes the existence of two or more distinct unobserved classes of individuals that differ in prevalence of disorders, where presence versus absence of individual disorders is independent across disorders within classes and each person has a probability of class membership that sums to 1.0 within individuals across classes. Analysis consists of simultaneously estimating the vector of class membership probabilities associated with each observed multivariate disorder profile and prevalence of each disorder in each latent class for a fixed number of classes. A standard measure of model fit, the Lo–Mendell–Rubin adjusted likelihood ratio test with *p*-value of 0.05, was used to select a best model from among those estimated with different assumed numbers of latent classes. Once a final model is selected, survey respondents with a given disorder profile can be assigned to the class with the highest probability of membership for purposes of subsequent analysis.

Once we defined and interpreted the latent classes, SAS version 9.4 (SAS Institute Inc., 2010) was used to examine associations of LCA classes with both 12-month sociodemographic variables and 12-month STBs using logistic regression analysis. Area under the receiver operating characteristic curve was calculated to characterize the strength of these associations. The LCA classes were treated as the outcomes in a multinomial logistic regression analysis of sociodemographic predictors. The LCA classes were then treated as the predictors in logistic regression analyses to predict STBs. The extent to which the LCA classes captured the multivariate associations of the seven disorders with STBs was then examined by estimating models that included disorders, classes, and both as predictors of STBs and comparing AUCs across models. Logistic regression coefficients and their 95% confidence intervals (CIs) were exponentiated to create odds ratios (ORs) and associated 95% CIs to facilitate interpretation. All results were pooled across countries. Due to the variable within-country sample sizes, no attempt was made to search for variation in associations across countries.

Statistical significance of individual coefficients was evaluated consistently using two-sided tests with multiple imputation significance level α set at 0.05. But another issue can be raised about the possibility that the significance of some individual predictors was due to chance in the analysis of such a large number of predictors. Our main concern about this issue focused on the LCA classes, as our previous research has documented global significance of sociodemographic variables predicting mental disorders (Auerbach et al., 2018) and mental disorders predicting STBs (Mortier, Auerbach, et al., 2018). We address the concern by reporting global significance tests for the associations of the LCA classes as a set with STBs controlling for the component mental disorders.

3 | RESULTS

3.1 | Sociodemographic distribution of the sample

Sociodemographic information is summarized in Table 2. The majority of respondents (54.8%) were female. Most of the others were male (44.7%), and the small remaining number defined themselves as either transgender or “other” (0.5%). Most respondents were 16–18 years of age (51.1%), and the vast majority (96.5%) were full-time students.

3.2 | Latent class analysis

Prevalence of at least one 12-month disorder was 38.4% in the pooled cross-national analysis that weighted each country to have equal representation in the sample. This is somewhat different from the prevalence found in an earlier analysis in which we did not include ADHD diagnoses and excluded part-time and transgender students (Auerbach et al., 2018). The LCA found that a four-class solution provided the best fit to the data (Table S1). All students in three of the four classes met criteria for at least one 12-month disorder, whereas the largest class included both respondents with exactly one disorder or no 12-month disorders. We separated these two groups in our analysis and also distinguished between respondents with no 12-month disorders depending on whether or not they met criteria for any lifetime disorder, resulting in a total of six classes being included in the analysis.

By far the smallest of these classes was Class 1 (C1; Figure 1). The 1.9% of respondents in C1 all met criteria for four or more 12-month disorders, the vast majority of them including mania/hypomania (77.9%). All had at least one internalizing disorder (especially major depression disorder and generalized anxiety disorder) and virtually all (95.2%) had either substance use disorder and/or ADHD. The next smallest class was C2. Nearly all the respondents in C2 (5.8% of respondents) met criteria for either two (72.0%), three (21.3%), or more (6.0%) 12-month disorders. The most striking differences between C2 and C1 were that respondents in C2 had much lower prevalence of mania/hypomania (14.7% vs. 77.9%) and anxiety disorders (6.8–12.8% vs. 49.3–98.3%) than respondents in C1. Prevalence of at least one externalizing disorder (i.e., substance use disorder or ADHD), in comparison, was relatively similar in C1 (94.8%) and C2 (95.2%).

TABLE 2 The sociodemographic distribution of the pooled cross-national sample ($n = 14,348$)

Category	%	(SE)
Gender		
Male	44.7	(0.6)
Female	54.8	(0.6)
Trans, other	0.5	(0.1)
Age (in years)		
16–18	51.1	(0.6)
19	25.8	(0.6)
20–21	12.2	(0.4)
22+	10.9	(0.4)
Enrollment status		
Full-time	96.5	(0.2)
Part-time, nondegree, other, or missing student status	3.5	(0.2)
Parental education		
College graduate	57.1	(0.7)
Some postsecondary education	24.2	(0.6)
No postsecondary education	18.7	(0.5)
Parental marital intactness		
Both alive and married to each other	73.8	(0.6)
Either deceased or not married to each other	26.2	(0.6)
Place raised		
Large city	26.7	(0.6)
Small city	27.9	(0.6)
Suburbs	17.1	(0.6)
Town/village	20.7	(0.6)
Rural area	7.6	(0.4)
Religion		
Christian	61.7	(0.7)
Another religion	7.4	(0.4)
No religion	30.9	(0.6)
Sexual orientation		
Heterosexual without same-sex attraction	72.4	(0.6)
Heterosexual with same-sex attraction	14.1	(0.4)
Nonheterosexual without same-sex sexual intercourse	8.1	(0.4)
Nonheterosexual with same-sex sexual intercourse	5.4	(0.3)
Current living situation		
Parents or other relative or own home	56.4	(0.7)
University or college hall of residence	27.5	(0.7)
Shared house or apartment/flat	11.1	(0.4)
Private hall of residence	3.3	(0.3)
Other	1.7	(0.2)
Expected to work a student job		
Yes	72.7	(0.6)
No or unsure	27.3	(0.6)
Self-reported ranking in high school		

(Continues)

TABLE 2 (Continued)

Category	%	(SE)
Top 5%	24.7	(0.6)
Top 6–10%	22.3	(0.6)
Top 11–30%	30.1	(0.6)
Bottom 70%	22.9	(0.6)
Most important reason to go to college		
Intrinsic	89.5	(0.6)
Extrinsic	10.5	(0.4)

Note. The data are weighted so that each country has an equal weight.

C3 was considerably more prevalent (14.6% of respondents) than C1 or C2. All C3 respondents met criteria for at least one 12-month disorder and 77.0% met criteria for two or more disorders. All C3 respondents met criteria for at least one internalizing disorder and a much smaller proportion (42.1%) met criteria for either alcohol use disorder (37.7%) or ADHD (6.9%). None of the C3 respondents met criteria for drug use disorder. The remaining respondents met criteria for either only one (16.1%) or none (61.6%) of the 12-month disorders assessed in the survey. We defined C4 for purposes of analysis as consisting exclusively of students who met criteria for only one disorder. By far the most common disorders in C4 were ADHD (40.3%) and major depression disorder (32.8%). It is noteworthy that the original C4 respondents without any 12-month disorders included roughly equal numbers with a lifetime history of at least one remitted DSM-IV disorder (C5; 29.2% of the total sample) and no lifetime history of any of the DSM-IV disorders assessed in the survey (C6; 32.4% of the total sample). (See Table S2 for a more detailed description of precise prevalence estimates of individual disorders within classes.)

3.3 | Sociodemographic correlates of latent class membership

A number of sociodemographic variables were significant correlates of being in C1, the high comorbidity class (vs. being in C6, the no lifetime disorder class), in a multivariate model that included all these predictors (Table 3). The highest ORs were associated with nonheterosexual orientation either with (OR = 14.5) or without (OR = 16.5) same-sex intercourse (compared with heterosexual without same-sex attraction) and self-identifying as transgender/other gender (OR = 12.6; compared with male). Other significant correlates included being female (OR = 1.6; compared with male), ages 20–21 or 22+ (OR = 2.5–3.2; compared with 16–18), parents either not married or deceased (OR = 2.1), heterosexual with some same-sex attraction (OR = 4.0; compared with no same-sex attraction), not graduating in the top 5% of one's high school class (OR = 2.0–3.5; strongest for the lowest class ranking), and having primary extrinsic reasons for attending college (OR = 2.4). The AUC of a multivariable model with all sociodemographic predictors and country dummies was 0.89. The 10% of respondents with the highest predicted probabilities of being in C1 in that model accounted for 56.4% of all C1 cases.

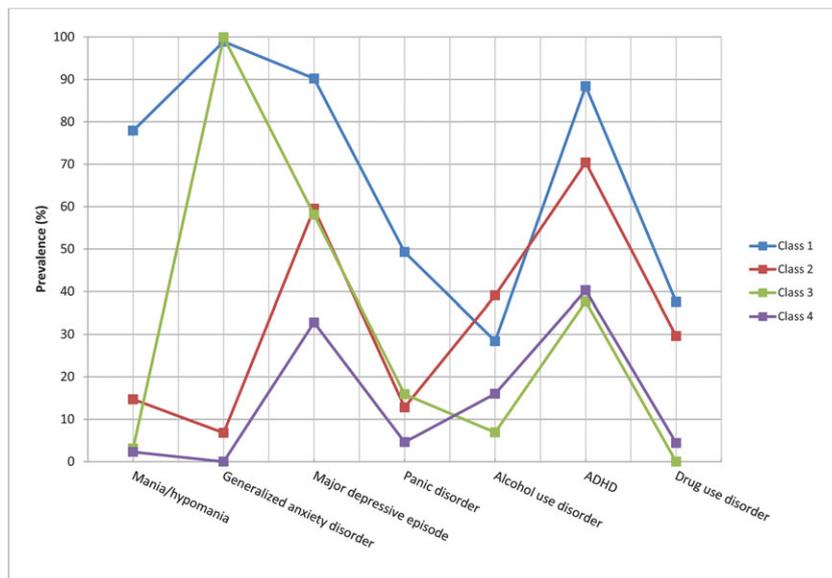


FIGURE 1 Prevalence of disorders within each latent class. ADHD: attention-deficit/hyperactive disorder

As with C1, the strongest sociodemographic correlates of being in C2, the comorbid class characterized by higher prevalence of externalizing than internalizing disorders, were nonheterosexual orientation either with (OR = 8.2) or without (OR = 4.5) same-sex intercourse (compared with heterosexual without same-sex attraction). There was one fewer significant correlate of C2 than C1 and the ORs were less pronounced. These correlates included being male (i.e., significantly reduced relative-odds associated with being female; OR = 0.8), ages 20–21 and 22+ (OR = 1.5–2.1; compared with ages 16–18, weaker effect for ages 22+), parents not both alive and married (OR = 1.6), low parental education (OR = 0.7; compared with high parental education), living in a college residence hall (OR = 1.4; compared with living with parents), no religion (OR = 1.5), heterosexual orientation with some same-sex attraction (OR = 2.8; compared with heterosexual without same-sex attraction), and graduating outside the top 10% of one's high school (OR = 1.7–2.5; compared with being in the top 5% of the class). The AUC of a multivariate model with all sociodemographic predictors of C2 versus C6 was 0.76. The 10% of respondents with highest predicted probabilities of being in C2 in that model accounted for 33.2% of all C2 cases.

The sociodemographic correlates of being in C3, the class associated with lower comorbidity and a much higher prevalence of internalizing than externalizing disorders, and C4, the class with pure 12-month disorders, were strikingly similar to those of C2. The correlates of C3 differed from those of C2 only in including self-identification as transgender/other (OR = 10.0) compared with male, non-Christian (OR = 1.4), and lowest 70% of high school class ranking (OR = 1.4) rather than the two lowest levels in C2, and having generally somewhat weaker ORs with the other correlates than in the prediction of C2. The AUC of a multivariate model with all sociodemographic predictors of C3 versus C6 was 0.75. The 10% of respondents with highest predicted probabilities of being in C3 accounted for 23.6% of all C3 cases.

The correlates of C4 differ from those of C2 only in including self-identification of transgender/other (OR = 3.8; compared with male), age 19 (OR = 1.2), non-Christian religion (OR = 1.8; compared with Christian religion), and residence in group housing (OR = 1.3 compared

with living with parents). The significant ORs of sociodemographics with C4 were generally somewhat weaker than those with C3. The AUC of a multivariate model with all sociodemographic predictors of C4 versus C6 was 0.66. The 10% of respondents with highest predicted probabilities of being in C4 in that model accounted for 17.7% of all C4 cases.

The sociodemographic correlates of being in C5, the class associated with one or more lifetime disorders but no 12-month disorders, finally, were the weakest and most inconsistent of all, although with an overall pattern of significance similar to C2–C3 in that ORs were significantly elevated among respondents older than 19 (OR = 1.2–1.6), with parents not both alive and married (OR = 1.3), non-Christian religion (OR = 1.6), nonheterosexual orientation (OR = 1.4–1.7), and having been in the two lowest levels of high school class ranking (OR = 1.2–1.3). The AUC of a multivariate model with all sociodemographic predictors of C5 versus C6 was 0.62. The 10% of respondents with highest predicted probabilities of being in C5 in that model accounted for 13.6% of all C5 cases.

3.4 | Associations of latent classes with 12-month STBs

Pooled cross-national 12-month prevalence of STBs was 17.6% for SI, 9.2% for suicide plan (SP), and 1.1% for SA when the sample was weighted to give equal representation to each country. As shown in an earlier report from this survey (Mortier, Auerbach, et al., 2018), these pooled estimates were somewhat different because of the exclusion of ADHD as a diagnosis, part-time students, and transgender students. A generally monotonic association was found between complexity of comorbidity and prevalence of 12-month STBs across the 12-month LCA classes (Table 4). C1 had by far the highest prevalence of SI (68.6% vs. 17.6% in the total sample), SP (51.5% vs. 9.2% in the total sample), and SA (15.4% vs. 1.1% in the total sample). Prevalence was lower and roughly equal in C2–C3 and successively lower in classes C4, C5, and C6. It is noteworthy that the differences in STB risk across LCA classes differed for SP and SA compared with SI, a

TABLE 3 Associations of sociodemographic and college-related variables predicting 12-month LCA class membership

Correlates	Class 1				Class 2		Class 3		Class 4		Class 5	
	%	(SE)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Gender												
Male	44.7	(0.6)										
Female	54.8	(0.6)	1.6*	(1.1, 2.3)	0.8*	(0.7, 1.0)	2.6*	(2.3, 3.0)	0.9	(0.8, 1.1)	1.1*	(1.0, 1.2)
Trans, other	0.5	(0.1)	12.6*	(1.7, 91.4)	2.0	(0.4, 9.7)	10.0*	(4.0, 25.0)	3.8*	(1.5, 9.5)	1.4	(0.5, 3.7)
F ₂			5.4*		2.7		108.1*		4.4*		2.4	
Age												
16–18	51.1	(0.6)										
19	25.8	(0.6)	1.2	(0.7, 1.9)	1.2	(0.9, 1.5)	1.1	(0.9, 1.2)	1.2*	(1.0, 1.4)	1.1	(1.0, 1.2)
20–21	12.2	(0.4)	2.5*	(1.4, 4.3)	2.1*	(1.6, 2.8)	1.4*	(1.2, 1.8)	1.2	(1.0, 1.4)	1.2*	(1.0, 1.4)
22+	10.9	(0.4)	3.2*	(1.8, 5.6)	1.5*	(1.1, 2.2)	1.2	(1.0, 1.6)	1.4*	(1.1, 1.8)	1.6*	(1.3, 1.9)
F ₃			7.0*		8.1*		4.5*		3.9*		9.0*	
Enrollment status												
Part-time, nondegree, other, or missing student status	3.5	(0.2)	0.8	(0.3, 2.3)	2.4*	(1.5, 4.0)	1.2	(0.8, 1.7)	1.4	(1.0, 1.9)	1.1	(0.8, 1.5)
Parental education												
College graduate	57.1	(0.7)										
Some postsecondary education	24.2	(0.6)	1.2	(0.7, 2.0)	1.1	(0.9, 1.4)	1.0	(0.8, 1.2)	0.9	(0.8, 1.1)	1.0	(0.8, 1.1)
No postsecondary education	18.7	(0.5)	0.8	(0.4, 1.6)	0.7*	(0.5, 0.9)	0.9	(0.8, 1.1)	0.9	(0.7, 1.1)	0.9	(0.7, 1.0)
F ₂			0.5		4.5*		0.2		0.8		1.8	
Either deceased or not married to each other	26.2	(0.6)	2.1*	(1.3, 3.5)	1.6*	(1.3, 2.1)	1.5*	(1.3, 1.8)	1.4*	(1.2, 1.6)	1.2*	(1.1, 1.4)
Place raised												
Large city	26.7	(0.6)										
Small city	27.9	(0.6)	0.7	(0.3, 1.3)	0.9	(0.7, 1.2)	1.0	(0.8, 1.2)	0.9	(0.7, 1.1)	1.0	(0.8, 1.1)
Town/village	20.7	(0.6)	1.2	(0.6, 2.2)	1.0	(0.7, 1.4)	1.1	(0.9, 1.3)	1.0	(0.8, 1.2)	1.1	(0.9, 1.3)
Suburbs	17.1	(0.6)	1.6	(0.8, 3.3)	1.2	(0.8, 1.6)	1.2	(1.0, 1.5)	0.9	(0.7, 1.1)	0.8	(0.7, 1.0)
Rural area	7.6	(0.4)	1.7	(0.7, 3.9)	1.0	(0.7, 1.6)	1.1	(0.8, 1.4)	0.9	(0.7, 1.2)	0.9	(0.7, 1.2)
F ₄			2.1		0.5		0.9		0.4		1.5	
Religion												
Christian	61.7	(0.7)										
No religion	30.9	(0.7)	1.5	(0.9, 2.6)	1.5*	(1.2, 2.0)	1.4*	(1.2, 1.7)	1.3*	(1.1, 1.5)	1.1	(1.0, 1.3)
Another religion	7.4	(0.4)	2.3	(0.9, 5.6)	1.6	(1.0, 2.4)	1.6*	(1.2, 2.1)	1.8*	(1.4, 2.5)	1.6*	(1.2, 2.1)
F ₂			2.0		5.5*		12.1*		12.0*		6.8*	
Sexual orientation												
Heterosexual: no same-sex attraction	72.4	(0.6)										
Heterosexual: some same-sex attraction	14.1	(0.4)	4.0*	(2.2, 7.4)	2.8*	(2.0, 3.9)	2.5*	(2.0, 3.0)	1.9*	(1.6, 2.3)	1.4*	(1.2, 1.7)
Nonheterosexual without same-sex sexual intercourse	8.1	(0.4)	16.5*	(7.8, 34.8)	4.5*	(2.8, 7.3)	3.8*	(2.8, 5.2)	2.9*	(2.2, 3.8)	1.6*	(1.2, 2.0)
Nonheterosexual with same-sex sexual intercourse	5.4	(0.3)	14.5*	(5.5, 38.3)	8.2*	(5.5, 12.4)	4.7*	(3.1, 7.2)	3.1*	(2.0, 4.7)	1.7*	(1.2, 2.5)
F ₃			26.5*		40.1*		51.9*		32.4*		9.4*	
Current living situation												
Parents or other relative or own home	56.4	(0.7)										
University or college hall of residence	27.5	(0.7)	1.1	(0.5, 2.4)	1.4*	(1.0, 2.0)	1.0	(0.7, 1.3)	1.4*	(1.1, 1.7)	0.9	(0.8, 1.1)
Shared house or apartment/flat	11.1	(0.4)	1.5	(0.7, 3.3)	1.2	(0.9, 1.7)	0.9	(0.6, 1.2)	1.3*	(1.0, 1.6)	1.1	(0.9, 1.3)
Private hall of residence	3.3	(0.3)	1.8	(0.6, 5.4)	1.6	(0.8, 3.1)	0.9	(0.6, 1.5)	1.5	(1.0, 2.4)	1.0	(0.7, 1.5)
Other	1.7	(0.2)	0.5	(0.0, 6.3)	0.8	(0.3, 2.2)	0.5	(0.2, 1.1)	1.2	(0.6, 2.2)	1.4	(0.9, 2.1)
F ₄			0.5		1.6		0.9		3.1*		9.4*	
Expected to work a student job	72.7	(0.6)	1.1	(0.6, 1.9)	1.1	(0.8, 1.4)	0.9	(0.8, 1.1)	1.0	(0.8, 1.2)	1.0	(0.9, 1.2)
Self-reported ranking in high school												
Top 5%	24.7	(0.6)										

(Continues)

TABLE 3 (Continued)

Correlates	Class 1				Class 2		Class 3		Class 4		Class 5	
	%	(SE)	OR	(95% CI)								
Top 6–10%	22.3	(0.6)	2.0*	(1.0, 3.9)	1.1	(0.8, 1.5)	1.2	(1.0, 1.4)	1.1	(0.9, 1.3)	1.1	(0.9, 1.2)
Top 11–30%	30.1	(0.6)	2.1*	(1.1, 4.1)	1.7*	(1.4, 2.2)	1.0	(0.9, 1.2)	1.5*	(1.3, 1.8)	1.5*	(1.1, 1.4)
Bottom 70%	22.9	(0.6)	3.5*	(1.8, 6.7)	2.5*	(1.9, 3.3)	1.4*	(1.1, 1.7)	1.7*	(1.4, 2.0)	1.2*	(1.1, 1.4)
F ₃			5.1*		16.1*		4.7*		15.3*		4.7*	
Most important reason to go to college extrinsic	10.5	(0.4)	2.4*	(1.2, 5.0)	1.2	(0.9, 1.8)	1.4*	(1.1, 1.9)	1.2	(1.0, 1.6)	1.2	(1.0, 1.4)
(n)	(14,348)		(5,195)		(5,697)		(6,761)		(7,233)		(9,546)	

Note. LCA: latent class analysis. Class 6 is the outcome contrast for all odds ratios (ORs), where ORs are compared with the omitted Class 6, where Class 1 = high comorbidity; Class 2 = other internalizing-externalizing comorbidity; Class 3 = primarily internalizing comorbidity; Class 4 = pure disorders; Class 5 = no 12-month disorders with a lifetime history of at least one disorder; Class 6 = no lifetime disorders.

*Significant at the 0.05 level, two-sided test.

pattern that can be seen by inspecting the ORs in Table 4. Sociodemographics are not controlled in estimating these models. Results are especially striking for C1, where the OR relative to C6 increased from 43.3 in predicting SI to 61.6 for SP and to 175.5 for SA. This increase for C1 can be seen even in comparison with the classes with the next highest risks, C2–C3, where the ratio of ORs is roughly 3:1 for SI (i.e., 43.3 vs. 14.6–13.7) and SP (i.e., 61.6 vs. 21.1–23.1) but becomes 6–10:1 for SA (i.e., 175.5 vs. 17.7–25.4). An analysis of between-class differences in SA among respondents with SI (SA/SI) controlling for SP (detailed results not reported but available on request) shows that C1 had an elevated relative-odds (OR = 6.4; vs. C6) but that the ORs of C2–C5 were not significantly different from C6.

3.5 | The joint associations of classes and disorders with STBs

It is noteworthy that the AUCs of the models in which LCA classes predicted 12-month STBs (0.75–0.87) were roughly comparable with those of the models in which the disorders underlying the classes predicting the same outcomes (0.74–0.89; Table 5). The AUCs increased slightly, though, in most of the models that added disorders

to the classes to predict the same outcomes (0.76–0.89). This indicates that disorders might predict within-class differences in STBs. We explored this possibility initially by investigating the extent to which disorders interacted with classes in predicting STBs. None of these interactions were statistically significant.

On the basis of this result, we used stepwise logistic analysis to determine which disorders were significant predictors in overall models that controlled for classes. These associations were much less pronounced for SA than for SI or SP (Table 6). Five disorders were significant in the SI model, four in the SP model, two in the SA model, and only one in the SA/SI model. All 12 of these ORs were positive (in the range 1.3–5.2). The most consistently significant ORs were associated with mania/hypomania (in three of four models; OR = 1.4–2.1) and generalized anxiety disorder (in all four models; OR = 2.2–5.2). The other disorders were significant only in predicting one outcome, either SI (major depressive disorder, ADHD, drug use disorder; OR = 1.3–4.7) or SP (panic disorder, alcohol use disorder; OR = 1.4).

Importantly, the latent classes were significant as a set in all four models. The 15 significant ORs in those models were all positive (in the range OR = 2.2–21.1). The ORs for all classes C1–C5 were roughly comparable in predicting SI (OR = 2.2–3.8), but the OR for C1 has the highest in predicting both SP (OR = 8.4) and SA (OR = 21.1) as well as the only significant LCA predictor of SA/SI (OR = 7.3). The significant

TABLE 4 Associations of 12-month LCA classes predicting 12-month suicidal thoughts and behaviors

Class	Ideation				Plan				Attempt				Attempt/SI			
	%	(SE)	OR	(95% CI)	%	(SE)	OR	(95% CI)	%	(SE)	OR	(95% CI)	%	(SE)	OR	(95% CI)
Class 1	68.6*	(4.8)	43.3*	(31.4, 59.8)	51.5*	(5.1)	61.6*	(42.7, 88.8)	15.4*	(3.4)	175.5*	(54.6, 564.8)	22.5	(4.8)	13.7*	(4.2, 44.5)
Class 2	41.4*	(3.0)	14.6*	(11.5, 18.5)	26.2*	(2.7)	23.1*	(16.6, 32.1)	1.8*	(0.7)	17.7*	(5.0, 62.9)	4.2	(1.6)	2.2	(0.6, 7.7)
Class 3	40.0*	(1.6)	13.7*	(11.5, 16.3)	24.9*	(1.5)	21.1*	(15.9, 28.0)	2.6*	(0.5)	25.4*	(8.2, 78.5)	6.5	(1.3)	3.1	(1.0, 9.6)
Class 4	21.3*	(1.3)	5.8*	(4.8, 7.0)	9.9*	(1.0)	7.5*	(5.5, 10.2)	1.3*	(0.4)	13.2*	(4.1, 41.8)	5.9	(2.0)	3.3*	(1.0, 10.5)
Class 5	11.0*	(0.8)	2.7*	(2.3, 3.3)	3.5*	(0.4)	2.6*	(1.9, 3.6)	0.2	(0.1)	1.8	(0.4, 7.0)	1.5	(0.9)	0.7	(0.2, 2.7)
Class 6	4.4*	(0.5)			1.4*	(0.3)			0.1	(0.1)			2.3	(2.1)		
F ₅			247.3*				174.9*				36.5*				10.4*	
Total	17.6*	(0.5)			9.2*	(0.4)			1.1*	(0.1)			6.0*	(0.7)		
(n)	(14,348)				(14,348)				(14,348)				(1,843)			

Note. LCA: latent class analysis; SI: suicide ideation. Unlike in Table 3, where the LCA classes are treated as the outcomes in the logistic regression analyses, the classes are treated here as predictors of 12-month suicidality. Prevalence estimates of suicidality are different from those reported by Mortier, Cuijpers et al., 2018 due to the slightly different sample composition.

*Significant at the 0.05 level, two-sided test.

TABLE 5 Area under the ROC curve of alternative models to predict 12-month suicide ideation, suicide plan, suicide attempt, and attempt among ideators

Predictors	Idea	Plan	Attempt	Attempt/SI
Classes	0.79	0.83	0.87	0.75
Disorders	0.79	0.85	0.89	0.74
Classes and disorders	0.81	0.85	0.89	0.76
(n)	(14,348)	(14,348)	(14,348)	(1,843)

Note. ROC: receiver operating characteristic; SI: suicide ideation. Pooling across all multiply imputed observations based on models that include dummy predictors for country.

OR for C5 was the lowest in predicting SP (OR = 2.7 vs. OR = 3.7–7.0 for C2–C4) and the only nonsignificant OR in predicting SA (compared with significant ORs = 4.7–7.5 for C2–C4). These significantly elevated ORs for class membership in models that also control underlying disorders are most plausibly interpreted as due to synergistic effects of comorbidity on STBs.

4 | DISCUSSION

The current report from the WHO WMH-ICS initiative provides results from first year college students in 19 colleges across eight countries. The unique contribution of this report is the documentation of the existence of four latent classes of students with multivariate disorder profiles across seven 12-month DSM-IV disorders. The smallest of these classes (1.9% of all students) was characterized by extremely high comorbidity. Two other comorbid classes were characterized, respectively, by primarily internalizing disorders (14.6%) and by a combination of internalizing and externalizing disorders (5.8%). These classes were found to be very strongly predictive of 12-month STBs. Although a number of disorders also predicted STBs, the ORs of the classes remained significantly elevated even after controlling for individual disorders. The latter result documents the existence of interactive predictive effects of the disorders in the classes.

Interestingly, we found a number of sociodemographic and college-related variables that had statistically significant associations with LCA class prevalence. Two prominent correlates of comorbidity included transgender students and sexual minority students (i.e., heterosexual students with some same-sex attraction and nonheterosexual students both with and without same-sexual intercourse). In our previous publication (Auerbach et al., 2018), these students reported high rates of mental disorders compared with other college students, which is unsurprising given that prior to arriving on college campus, many are subject to family rejection, bullying, and social isolation (Dean et al., 2000; Heatherington & Lavner, 2008). Further, once on college campus, these students are frequently marginalized and harassed (Rankin, 2003; Tetreault, Fette, Meidlinger, & Hope, 2013). Despite the greater incidence of mental disorders and comorbidity, transgender and sexual minority students are often less likely to utilize counseling services (e.g., Beemyn, Curtis, Davis, & Tubbs, 2005). Doubtlessly, college campuses have made painstaking efforts to be more inclusive of students with varied needs and backgrounds. That said, there remain critical institutional barriers to clinical care. Some

transgender and sexual minority students continue to face insensitivity and discrimination from healthcare workers (e.g., Sperber, Landers, & Lawrence, 2005). And even well-intentioned counselors may feel that they lack the cultural competence or expertise to treat these students and, thus, do not take them on as patients (Shipherd, Green, & Abramovitz, 2010). Collectively, the current findings underscore the need for counseling centers to develop more diverse cultural competencies and outreach strategies to address patient populations that are presenting with escalating rates of mental disorders, the most complex psychiatric comorbidity, and the highest risk for STBs (Mortier, Cuijpers, et al., 2018).

Several important findings emerged in our analysis of the LCA–STB relationship. Notably, the ORs of the LCA classes in predicting STBs were higher for SP than SI and higher for SA than SP (but also were significant for SA/SI). This is quite different from the pattern found in the numerous previous studies that examined individual mental disorders as predictors of STBs, as the most highly elevated ORs on those studies were usually associated with SI, were successively weaker predicting SP and SA, and were usually nonsignificant predicting SA/SI (Kessler, Borges, & Walters, 1999; Nock et al., 2008; but see Nock, Hwang, Sampson, & Kessler, 2010). This kind of successively weaker prediction pattern was found for the individual mental disorders in the models that controlled for LCA classes, with five disorders predicting SI, four predicting SP, two predicting SA, and only one predicting SA/SI. Additionally, the finding that ~15% of C1 respondents made an SA in the past 12 months is noteworthy. Prior research has shown that effectiveness of universal suicide prevention is limited (e.g., improving help-seeking behavior in suicide prevention efforts; Klimes-Dougan, Klingbeil, & Meller, 2013), and coupled with limited resources, it is essential for universities to strategically identify subsets of high-risk students and offer indicated prevention services. Our findings suggest that students reporting high comorbidity may be at elevated risk of SA, which is consistent with prior research (Nock et al., 2010) and highlights a specific role for (hypo)mania and generalized anxiety disorder in predicting SA, which is in line with recent theories on the importance of affective disturbance and overarousal (including core features such as insomnia and irritability) in predicting suicidal intent (particularly when combined with feelings of alienation or helplessness; Stanley, Rufino, Rogers, Ellis, & Joiner, 2016). More broadly, the results underscore that relatively low-cost web-based screening tools may be effective in reaching high-risk students in need of help (Mortier et al., 2017) and, if integrated with prevention and intervention services, may reduce the incidence of STB on college campuses.

Given the limited mental health resources that exist on most college campuses relative to the scope of the problem and the importance of comorbidity for treatment planning, it might be prudent to think in terms of latent classes when targeting treatment outreach efforts. This is especially true given the finding that comorbidity becomes an increasingly important predictor of STB in the progression from SI to SA. Focusing on profiles of disorders rather than a specific diagnosis is consistent with recent transdiagnostic approaches to treatment (e.g., Unified Protocol; Barlow et al., 2017), which target common underlying factors that cut across disorders. Transdiagnostic therapeutic approaches have been designed to tackle the limitations

TABLE 6 Associations of 12-month LCA classes and 12-month disorders predicting 12-month suicidal thoughts and behaviors

Predictors	Ideation		Plan		Attempt		Attempt/SI	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Class 1	2.8*	(1.1, 6.8)	8.4*	(4.9, 14.6)	21.1*	(4.9, 91.3)	7.3*	(1.7, 31.8)
Class 2	3.8*	(2.7, 5.4)	6.7*	(4.6, 9.7)	4.7*	(1.2, 18.6)	1.3	(0.3, 5.8)
Class 3	2.2*	(1.1, 4.4)	7.0*	(5.1, 9.7)	7.5*	(2.2, 25.3)	1.8	(0.4, 7.2)
Class 4	2.8*	(2.3, 3.5)	3.7*	(2.6, 5.1)	6.0*	(1.8, 20.4)	2.1	(0.5, 8.6)
Class 5	2.8*	(2.3, 3.3)	2.7*	(1.9, 3.6)	1.8	(0.4, 7.0)	0.7	(0.1, 3.3)
F ₅	26.4*		29.7*		5.2*		6.6*	
Internalizing disorders								
Mania/hypomania	1.4*	(1.1, 2.0)	1.6*	(1.2, 2.3)	2.1*	(1.0, 4.1)		
Generalized anxiety disorder	2.2*	(1.2, 4.2)	4.6*	(3.9, 5.6)	5.2*	(3.1, 8.8)	2.0*	(1.1, 3.6)
Major depressive episode	4.7*	(4.0, 5.4)						
Panic disorder			1.4*	(1.1, 1.7)				
Externalizing disorders								
Alcohol use disorder			1.4*	(1.2, 1.8)				
ADHD	1.3*	(1.1, 1.5)						
Drug use disorder	1.4*	(1.1, 1.9)						
(n)	(14,348)		(14,348)		(14,348)		(1,843)	

Note. LCA: latent class analysis; SI: suicide ideation; ADHD: attention-deficit/hyperactive disorder.

*Significant at the 0.05 level, two-sided mutually imputed design-corrected test.

of past psychotherapeutic approaches and to address issues of comorbidity (and subthreshold presentations), as these treatments intervene on core deficits that are common among disorders (e.g., behavioral avoidance and emotion dysregulation; Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010). A transdiagnostic approach to treatment also is in line with the focus on *mechanisms of action* to improve therapeutic outcomes. By targeting core therapeutic processes (e.g., alliance and adherence), phenotypes, and/or biological markers that are shared among a range of disorders, the goal is to determine *why* psychotherapeutic and pharmacologic interventions are effective as a means of improving outcomes that have remained relatively stagnant in recent decades (e.g., DeRubeis et al., 2005; Dimidjian et al., 2006). Nevertheless, as transdiagnostic approaches may disregard important differences between participants, a promising alternative might be a person-specific approach in which treatment modules—specifically using internet-based treatments—are based on the comorbidity, symptoms, and other characteristics tailored to each individual student (e.g., Weisel et al., 2018). As a whole, given high rates of comorbidity coupled with suboptimal treatment response rates with traditional tracks of care, there is an urgency to design and disseminate interventions that are effective across different profiles of disorders that are commonplace in college students.

4.1 | Limitations

Our findings should be considered in light of several limitations. First, the cross-national prevalence estimates are based on a convenience sample of colleges with relatively low and quite variable response rates, limiting generalizability of results. Second, not all common mental disorders were assessed in the surveys. Eating disorders, social anxiety disorder, phobias, post-traumatic stress disorder, conduct

disorder, oppositional-defiant disorder, and intermittent explosive disorder are especially noteworthy because of their comparatively high prevalence in the WMH surveys (Auerbach et al., 2016), and therefore, the true prevalence of mental disorders among college students may be higher than those reported in the current study, particularly as we are only including first year students who are not yet through the high-risk periods for many common disorders. However, we have developed screening scales for those disorders, and we are experimenting with a design in which subsets of these screening scales are rotated in future iterations of the surveys at random to provide partial information about prevalence and correlates of a wider range of disorders. This approach, which is referred to in the survey methodology literature as *matrix sampling* (Merkouris, 2015), is becoming an increasingly popular approach to reduce respondent burden when the number of questions of interest in a survey exceeds the number that causes respondent burden (Hughes, Beaghen, & Asiala, 2015; Thomas, Raghunathan, Schenker, Katzoff, & Johnson, 2006). Third, although the surveys used well-validated screening scales calibrated to yield unbiased prevalence estimates in general population samples, calibration studies have just begun in samples of college students. That said, we do not know if calibration studies in separate countries will show that concordance of the structured questions in our diagnostic screens are equally valid in all countries. Fourth, the LCA is based on the assumption that true underlying classes exist that lead the disorders to be conditionally independent within classes. If this assumption is incorrect, it might be that other methods would yield more useful characterizations of the multivariate profiles among disorders. This possibility needs to be investigated in future analyses of the WMH-ICS data. Last, although the study provides key information related to the impact of comorbidity on STBs, there are other important issues at large. Namely, future research would benefit from investigating the societal costs (e.g., lost productivity) associated with

different types of comorbidity. Additionally, for many of these disorders, it may be that different types of adversity and stress exposure may be driving the types of comorbidity students experience. Both of these issues remain critical, particularly as it relates to developing public health response plans.

5 | CONCLUSIONS

Consistent with prior epidemiological research, rates of comorbidity are high in college students (Auerbach et al., 2016). Presently, colleges around the world are faced with an increasingly challenging problem: There is a need to provide unparalleled access to cutting edge educational opportunities while contending with rising rates of mental disorders. Given finite resources, colleges will need to be strategic in how resources are distributed, particularly as this relates to prioritizing cases that are at highest risk for STBs. The current report coupled with recent national (e.g., Eisenberg et al., 2007; Kendler et al., 2015; Mojtabai et al., 2015) and cross-national (Auerbach et al., 2018; Mortier, Auerbach, et al., 2018) findings underscore the need to increase access to care, develop novel ways (e.g., internet-based therapies) to reach students in need, and generate ways to triage student mental health services on campus.

ACKNOWLEDGEMENTS

Funding to support this initiative was received from the National Institute of Mental Health (NIMH) R56MH109566 (R. P. A.), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or NIMH; the Belgian Fund for Scientific Research (11N0514N/11N0516N/1114717N) (P. M.), the King Baudouin Foundation (2014-J2140150-102905) (R. B.), and Eli Lilly (IIT-H6U-BX-I002) (R. B. and P. M.); BARMER, a health care insurance company, for project StudiCare (D. D. E.); ZonMw (Netherlands Organisation for Health Research and Development; Grant 636110005) and the PFGV (Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (P. C.); South African Medical Research Council and the Ithemba Foundation (D. J. S.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440), Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya (2017 SGR 452), FPU (FPU15/05728) (J. A.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER (PI13/00506) (G. V.); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (T. B.); Consejo Nacional de Ciencia y Tecnología (CONACyT) Grant CB-2016-01-285548 (C. B.). The World Mental Health International College Student (WMH-ICS) initiative is carried out as part of the WHO World Mental Health (WMH) Survey initiative. The WMH survey is supported by the National Institute of Mental Health NIMH R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the U.S. Public Health Service (R13-MH066849, R01-MH069864, and R01-DA016558), the Fogarty International Center (FIRCA R03-

TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (R. C. K.). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

CONFLICTS OF INTEREST

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis, was a consultant for Johnson & Johnson Wellness and Prevention, Shire, Takeda, and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a coowner of DataStat, Inc., a market research firm that carries out healthcare research.

Dr. Ebert has received consultant fees and served on the scientific advisory board for several companies, including MindDistrict, Lantern, Schoen Kliniken, and German health insurance companies (BARMER, Techniker Krankenkasse). He also is a stakeholder in the institute for health training online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Auerbach RP, Mortier P, Bruffaerts R, et al. Mental disorder comorbidity and suicidal thoughts and behaviors in the World Health Organization World Mental Health Surveys International College Student initiative. *Int J Methods Psychiatr Res.* 2019;28:e1752. <https://doi.org/10.1002/mpr.1752>

ORIGINAL ARTICLE

The role impairment associated with mental disorder risk profiles in the WHO World Mental Health International College Student Initiative

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Funding information

Belgian Fund for Scientific Research, Grant/Award Number: (11N0514N/11N0516N/1114717N) (PM) 11N0514N/11N0516N/1114717N; Eli Lilly, Grant/Award Number: (IIT-H6U-BX-I002) (RB, PM) IIT-H6U-BX-I002; Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER, Grant/Award Number: (PI13/00343); ISCIII, Grant/Award Number: (Río Hortega, CM14/00125) (Sara Borrell, CD12/00440); Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD, Grant/Award Number: (Exp. 2015I015); DIUE Generalitat de Catalunya, Grant/Award Number: (2017 SGR 452) FPU (FPU15/

Abstract

Objective: The objective of this study is to assess the contribution of mental comorbidity to role impairment among college students.

Methods: Web-based self-report surveys from 14,348 first-year college students (Response Rate [RR] = 45.5%): 19 universities, eight countries of the World Mental Health International College Student Initiative. We assessed impairment (Sheehan Disability Scales and number of days out of role [DOR] in the past 30 days) and seven 12-month DSM-IV disorders. We defined six multivariate mental disorder classes using latent class analysis (LCA). We simulated population attributable risk proportions (PARPs) of impairment.

Results: Highest prevalence of role impairment was highest among the 1.9% of students in the LCA class with very high comorbidity and bipolar disorder (C1): 78.3% of them had severe role impairment (vs. 20.8%, total sample). Impairment was lower in two other comorbid classes (C2 and C3) and successively lower in

05728); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER, Grant/Award Number: (PI13/00506); King Baudouin Foundation, Grant/Award Number: (2014-J2140150-102905) (RB) 2014-J2140150-102905; Protestants Fonds voor de Geestelijke Volksgezondheid, Grant/Award Number: Student survey project (PC); South African Medical Research Council, Grant/Award Number: DJS; US Public Health Service, Grant/Award Numbers: RO1 DA016558, R01-MH069864, R13-MH066849 and R01 DA016558; Fogarty International Center, Grant/Award Number: FIRCA R03-TW006481; Consejo Nacional de Ciencia y Tecnología, Grant/Award Number: CB-2016-01-285548; PFGV; ZonMw, Grant/Award Number: 636110005; BARMER, Grant/Award Number: StudiCare (DDE); National Institute of Mental Health (NIMH), Grant/Award Numbers: R01MH070884 and R56MH109566

the rest. A similar monotonic pattern was found for DOR. Both LCA classes and some mental disorders (major depression and panic, in particular) were significant predictors of role impairment. PARP analyses suggest that eliminating all mental disorders might reduce severe role impairment by 64.6% and DOR by 44.3%.

Conclusions: Comorbid mental disorders account for a substantial part of role impairment in college students.

KEYWORDS

college students, disability, role impairment

1 | INTRODUCTION

College students are a key group in society in terms of human capital (Abel & Deitz, 2012) as they play a major role in future economic growth and innovation. Most lifetime mental disorders begin in childhood or adolescence (Kessler, Amminger, et al., 2007), and the college years are consequently a peak period for prevalence of recent mental disorders. For instance, a meta-analysis estimated that 30.6% of college students meet criteria for major depression (Ibrahim, Kelly, Adams, & Glazebrook, 2013). Mental disorders have a substantial impact on academic performance (Auerbach et al., 2016; Kessler, Foster, Saunders, & Stang, 1995) and prematriculation onset disorders are strong predictors of college attrition (Auerbach et al., 2016). Mental disorders are also associated with lower employment in adulthood (Mojtabai et al., 2015). Therefore, it is important to detect and treat mental disorders when they exist among college students.

Knowledge about role impairment due to mental disorders among college students is insufficient. We recently reported (Alonso et al., 2018) a high prevalence of severe role impairment in first-year college students in eight countries. We found the highest levels of severe impairment in the domains of close personal relationships and social life and also found high levels of impairment in productive activities. Our results were consistent with previous studies in single countries (Verger, Guagliardo, Gilbert, Rouillon, & Kovess-Masfety, 2010). We also found in that prior report that number of comorbid mental disorders was positively associated with severe role impairment, but the shape of this association was not investigated in detail (Alonso et al., 2018). Taking comorbidity into account is essential given that mental disorders typically do not exist in isolation (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). In addition, for the purposes of intervention, different profiles of comorbidity might call for differentiated intervention services. The association of mental comorbidity with role impairment thus deserves further analysis.

An earlier study in this issue used latent class analysis (LCA) to identify comorbidity patterns (or classes) that are strongly predictive of 12-month suicidality beyond the risks associated with individual disorders, suggesting that there are interactive predictive effects of the disorders in these classes (Auerbach et al., 2018). The analysis found a very small proportion of students (1.9%) in a highly comorbid class associated with high prevalence of bipolar disorder (Class 1), larger proportions of students in two other comorbid classes characterized either by a combination of internalizing and externalizing disorders (Class 2, 5.8%) or mostly internalizing disorders (Class 3, 14.6%), and a final large class of students with pure disorders (16.1%; i.e., each student had only one disorder). Assessing the degree of association of those comorbidity classes with role impairment may help us understand specific care needs of students and facilitate trans-diagnostic interventions (Harrer et al., 2018). Addressing those needs may potentially reduce individual suffering of patients and their families as well as increase the long-term human capital of the societies that today's college students will embody in the future.

The World Health Organization (WHO) World Mental Health International College Student (WMH-ICS) Initiative was developed to obtain accurate longitudinal information about the frequency, correlates, and impact of mental, substance, and behavioral disorders among college students internationally (https://www.hcp.med.harvard.edu/wmh/college_student_survey.php). The aims also included assessing unmet need for treatment, developing a practical method for targeting students in need of outreach, and laying the groundwork for the implementation and evaluation of preventive and clinical interventions.

The objectives of this paper are to estimate among incoming first-year college students in the first wave of the WMH-ICS surveys (a) the prevalence of role impairment (home management/chores, work, close personal relationships and social life, and days out of role) associated with mental comorbidity classes; and (b) the role of comorbid mental disorders in accounting for these role impairments.

2 | METHOD

2.1 | Sample

The initial round of WMH-ICS surveys was carried out in a convenience sample of 19 colleges and universities (henceforth referred to as colleges) in eight countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Details on the participating countries and colleges are provided elsewhere (Alonso et al., 2018) and earlier in this issue of the journal (Auerbach et al., 2016; 2018). Web-based self-report questionnaires were administered to all incoming first-year students between October 2014 and February 2017. To participate in the survey, students had to be enrolled in the first year and fluent in the official language of the country. We excluded all those participants not meeting these inclusion criteria and those who did not provide informed consent. A total of 14,371 eligible questionnaires were completed, with sample sizes ranging from a low of 633 in Australia to a high of 4,580 in Belgium. The weighted (by achieved sample size) mean response rate across all surveys was 45.5%.

2.2 | Procedures

All incoming first-year students in the participating colleges were invited to participate in a web-based self-report health survey. The initial mode of contact varied across colleges, with the survey being either part of a health evaluation in some colleges, part of the registration process in others, and implemented as a stand-alone survey delivered via student email addresses in still others. In all cases other than in Mexico (see below), potential respondents were invited to participate and initial nonrespondents were recontacted through a series of personalized reminder emails containing unique electronic links to the survey. Ten colleges implemented conditional incentives in the final stages of refusal conversion (e.g., a raffle for store credit coupons and movie passes). In addition, one site (Spain) used an “end-game strategy” consisting of a random sample of nonrespondents at the end of the normal recruitment period that was offered incentives for participation. The situation was different in Mexico, where students were invited to participate in conjunction with mandatory activities, which varied from college to college (e.g., student health evaluations and tutoring sessions), with time set aside for completing the survey during the sessions. Informed consent was obtained before administering the questionnaires in all countries. Procedures for obtaining informed consent and protecting human participants were approved and monitored for compliance by the institutional review boards of the organizations coordinating the surveys in each country. At the end of the survey, all respondents received a general notification on how to access specialized mental health services at their colleges. Students who reported recent and/or severe suicide thoughts or behaviors additionally received more detailed information about available resources within their college and/or community. Details about ethics approval for the WHO WMH-ICS Initiative countries is available in this link: http://www.hcp.med.harvard.edu/wmh/ftpd/IRB_EthicsApproval_WMh-ICS.pdf.

2.3 | Measures

2.3.1 | Role impairment outcomes

Severity of health-related role impairment in the past 12 months was assessed using an adapted version of the Sheehan Disability Scale (SDS; Leon, Olfson, Portera, Farber, & Sheehan, 1997) that assessed impairment separately in each of four role domains: home management/chores, work roles, close personal relationships, and social life. Impairments in home management were defined as difficulties in such things as “cleaning, shopping, and working around the house, apartment or yard.” Impairments in work were defined as difficulties in the “ability to work as well as most of other people.” Impairments in close personal relationships were defined as difficulties in “the ability to initiate and maintain close personal relationships.” Impairments in social life, finally, were not defined. A 0 to 10 visual analogue scale was used to rate the degree of impairment for each domain. In each of these four cases (Ibrahim et al., 2013), respondents were asked to rate the extent to which problems with their physical or emotional health interfered with their activities in this area on a 0-to-10 scale with labels associated with scale values of *no* (0), *mild* (1–3), *moderate* (4–6), *severe* (7–9), and *very severe* (10) interference. A summary 0–40 scale that combines all four responses has a Cronbach's in the total sample of 0.87. Consistent with prior WMH reports (Kessler & Ustun, 2004; Wittchen, Nelson, & Lachner, 1998), we defined two dichotomies for each of the four SDS role domains as well as for the maximum score across these domains to define respondents who reported any impairment (i.e., scores in the range 1–10 versus 0) and severe interference (i.e., scores in the range 7–10 versus 0–6). In addition, respondents were asked how many days out of 30 in the past month they were totally unable to work or carry out their other normal daily activities because of problems with their physical or mental health or because of problems due to their use of alcohol or drugs.

2.3.2 | Mental disorders

Due to the size and logistical complexities of the surveys, it was impossible to administer an in-depth psychiatric diagnostic interview to each student. Instead, the survey instrument consisted of a series of short validated self-report screening scales for lifetime and 12-month prevalence of seven common DSM-IV disorders. These included four internalizing disorders (major depressive episode, mania/hypomania, generalized anxiety disorder, and panic disorder) and three externalizing disorders (attention deficit hyperactivity disorder [ADHD], alcohol abuse or dependence, and drug abuse or dependence involving either cannabis, cocaine, any other street drug, or a prescription drug either used without a prescription or used more than prescribed to get high, buzzed, or numbed out). This is a larger set of disorders than used in previous college mental health surveys, most of which either focused only on depression (for review, see Ibrahim et al., 2013) or included only screening scales of current anxious and depressive symptoms (Mahmoud, Staten, Hall, & Lennie, 2012). Although a much larger set of disorders is used in the face-to-face WMH (Scott, De Jonge, Stein, & Kessler, 2018), concerns were raised

about administering student surveys that would be long enough to include all those disorders. The seven disorders in the core WMH-ICS surveys were consequently a compromise that included the disorders associated with the highest levels of role impairment among college students in the WMH surveys (Auerbach et al., 2016). As an indication of the coverage of these disorders, 83% of the college students in the WMH surveys who reported suicidal ideation in the 12 months before interview met criteria for one or more of these seven disorders during that same time period.

The assessments of five of the seven disorders were based on the Composite international Diagnostic Interview Screening Scales (Kessler, Calabrese, et al., 2013). The other two disorders were based on the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) screen for alcohol use disorder and on the WHO Adult ADHD Self-Report Scale (Kessler et al., 2005) for adult ADHD. The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses based on the Structured Clinical interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1994), with area under the curve (AUC) in the range 0.70–0.78 (Kessler, Santiago, et al., 2013). However, these validation studies have not yet been carried out in samples of college students. The version of the AUDIT we used, which defined alcohol use disorder as either a total score of 16+ or a score of 8–15 with 4+ on the AUDIT dependence questions (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), has been shown to have concordance with clinical diagnoses in the range AUC = 0.78–0.91 (Reinert & Allen, 2002). Additional items taken from the CIDI (Kessler & Ustun, 2004) were used to assess age-of-onset of each disorder and number of lifetime years with symptoms. The DSM-IV version of the ASRS was found to have good concordance with blinded clinical diagnoses based on a standard research diagnostic interview for adult ADHD in two separate clinical studies (Kessler, Adler, et al., 2007; Kessler & Ustun, 2004).

In addition to assessing lifetime prevalence of all the above disorders other than ADHD, brief screening assessments were made for lifetime prevalence of binge-eating disorder, intermittent explosive disorder, and post-traumatic stress disorder, but 12-month evaluation of these disorders was not done in this initial round of the WMH-ICS surveys. This omission has been corrected in the more recent version of the survey that is currently being administered. For purposes of the analyses reported here, these disorders were coded as lifetime, but not 12-month, disorders even though it is almost certainly the case that at least some of these disorders were active in the 12 months before the survey. The inclusion of these disorders in the current analysis accounts for discrepancies in the proportion of students who are estimated to have lifetime disorders compared with the proportion presented in an earlier report (Auerbach et al., 2018).

2.3.3 | Socio-demographics and college-related factors

The following socio-demographic variables were included in the survey: gender, age, parental education, parental marital status, urbanicity of the place the student was raised, religious background, sexual orientation, the extent to which respondents were attracted to men

and women, and the gender(s) of people they had sex with (if any) in the past 5 years. Respondents were also asked where they ranked academically compared with other students at the time of their high school graduation, what their most important reason was to go to college, where they were living during the first semester of the academic year, and if they expected to work during the school year. More detailed descriptions of these measures are presented elsewhere (Alonso et al., 2018) and earlier in this issue (Auerbach et al., 2018).

2.4 | Analysis methods

2.4.1 | Weighting

The data were weighted to adjust for socio-demographic differences between survey respondents and the population data reported by college administrators. The analyses reported here are based on 14,348 respondents, for whom poststratification weights were computed. Standard methods for poststratification weighting were used for this purpose (Groves & Couper, 1998). Comparisons of these distributions showed that the only meaningful difference was that females had a somewhat higher response rate than males. In Spain, respondents to the end-game interviews were given a weight equal to $1/p$, where p represented the proportion of nonrespondents at the end of the normal recruitment period that was included in the end-game, to adjust for the undersampling of these hard-to-recruit respondents. This meant that the data were doubly weighted in the case of the Spanish survey, one to include the end-game weight and then with the poststratification weight applied to those weighted data. For the analyses, each country was given an equal sum of weights, with the total sum of weights across countries set at 14,348.

2.4.2 | Analysis of the associations between latent classes and impairment

As described in more detail in a separate paper in this issue (Auerbach et al., 2018), LCA (Magidson & Vermunt, 2004) was used to examine multivariate profiles among the seven 12-month DSM-IV disorders. LCA is an analysis approach that classifies each person in the analysis into one of a small number of multivariate profiles (referred to as “classes”), in this case defined by the cross-classification of the seven 12-month DSM-IV disorders in such a way as to capture the main patterns of comorbidity among these disorders. Once an optimal number of classes is selected and their characteristics defined, each respondent is assigned to the class with the highest probability of membership for purposes of subsequent analysis.

Once the latent classes were defined, SAS version 9.4 (SAS Institute Inc., 2017) was used to examine associations of LCA classes with role impairment using logistic regression analysis as well as ordinary linear regression for the association of LCA classes with number of days out of role. All models were adjusted by socio-demographic and college-related variables. Logistic regression coefficients and their 95% confidence intervals (CIs) were exponentiated to compute odds ratios (ORs) and associated 95% CIs to facilitate interpretation. All

results were pooled across countries using a fixed effects modeling (FEM) approach by including dummy control variables for country. Due to the variable within-country sample sizes, no attempt was made to search for variation in associations across countries. We chose FEM instead of a multilevel modeling approach to account for the nested structure of the data because our focus is on pooled within-group associations between individual-level predictors and outcomes rather than geographic variation in mean outcome scores. In a situation of this sort, FEM is preferable because it yields estimates of individual-level associations comparable with multilevel analysis without the restrictive, and in our case incorrect, assumption in the latter approach that the aggregate units (i.e., countries and universities within countries) represent random samples from the population of all such units (Goldstein, 2010).

We computed population attributable risk proportions (PARPs) of the impairment outcome measures due to the disorders considered here by using simulation methods. The simulations began by calculating the expected scores on the role impairment outcome measures based on prediction models that included the LCA classes as predictors. We then recalculated these individual-level predicted outcome scores based on the assumption that all respondents were in the class with no lifetime disorders. The difference in mean values of these two scores divided by the mean for the observed data was used to define the proportion of impairment that we might expect to be prevented with complete eradication of the mental disorders considered here. The implicit assumption here is that the coefficients in the prediction models were due to causal effects of disorders on impairments, although the PARP estimates are useful as descriptive measures of association even when this assumption of causality cannot be supported rigorously.

Due to the amount of item-level missing data in the surveys being relatively large (for the most part because not all surveys assessed all constructs), we used the method of multiple imputation by chained equations (Van Buuren, 2012) with 20 imputations per case to adjust for item-missing data. See Auerbach et al. (2018) for details about the missing data patterns. Significance tests were consistently carried out using .05-level two-sided multiple imputation-adjusted tests.

3 | RESULTS

3.1 | Socio-demographic distribution of the sample

As described in more detail elsewhere in this issue (Auerbach et al., in press), a majority of respondents (54.8%, ranging from 51.4% in Germany to 60.7% in the United States) were female and most others male (44.7%, range = 38.2% to 51.0%), with the small remaining number defining themselves as either transsexual or "other" (0.5%, range = 0.0% to 1.2%). Most respondents were either 16–18 years of age (51.1%), 19 (25.8%), or 20–21 (12.2%). The vast majority (96.5%) were full-time students. The majority of respondents defined themselves as heterosexual with no same-sex attraction (72.4%) and the others as either heterosexual with some same-sex attraction

(14.1%), nonheterosexual without same-sex intercourse (8.1%), or nonheterosexual with same-sex intercourse (5.4%).

3.2 | Distribution of comorbidity classes/patterns among 12-month mental disorders

A detailed report on 12-month prevalence of mental disorders in this sample is presented elsewhere (Auerbach et al., 2018). In addition, a report on the distribution of multivariate LCA profiles among these disorders is presented separately in this issue (Auerbach et al., 2018). As shown in that report, 38.4% of respondents screened positive for at least one of the 12-month disorders, and clear multivariate profiles among these disorders were detected in LCA. The least common class (C1; 1.9% of students) was made up of students with high comorbidity (four or more disorders, the majority including mania/hypomania). Three other classes consisted of students with combined internalizing-externalizing comorbidity (C2; 5.8%), mostly internalizing comorbidity (C3; 14.6%), and pure disorders (C4; 16.1%; that is, each student in this class had one and only one disorder). Two other classes consisted of students with no 12-month disorders that either did (C5; 29.2%) or did not (C6; 32.4%) have a lifetime history of one or more of the disorders.

3.3 | Prevalence of role impairments

About three quarters (74.6%) of students reported at least some health-related role impairment in at least one of the four SDS role domains (i.e., a score in the range 1–10 on at least one of the four 0-to-10 SDS scales; Table 1). Between 45.3% (home) and 61.6% (social) of students reported at least some impairment in each of the four role domains. Severe role impairments were much less common, with 20.8% of respondents reporting severe role impairment in at least one role domain and between 6.7% (home) and 12.4% (social) in individual role domains.

As expected, SDS role impairment scores were significantly associated with number of days out of role (Table 2). Students who reported severe role impairment in at least one SDS domain had a mean of 6.5 days out of role in the past 30 days compared with means of 2.5 days among students with nonsevere role impairment and 0.8 days among students with no role impairment on any SDS domain. The work role domain was most strongly associated with number of days out of role, and the mean number of such days among students who reported severe work role impairment (8.0 days) tended to be higher, although not significantly so in statistical terms, than the

TABLE 1 Distributions of Sheehan Disability Scale (SDS) impairment in the total sample ($n = 14,348$)

	Any		Severe		Severe/Any	
	%	(SE)	%	(SE)	%	(SE)
Home	45.3*	(0.7)	6.7*	(0.4)	14.9*	(0.8)
Work	58.7*	(0.6)	9.7*	(0.4)	16.6*	(0.6)
Relationship	57.3*	(0.6)	11.4*	(0.4)	20.0*	(0.7)
Social	61.6*	(0.6)	12.4*	(0.4)	20.1*	(0.7)
Any	74.6*	(0.5)	20.8*	(0.5)	27.8*	(0.7)

*Significant at the 0.05 level, two-sided MI-corrected test.

TABLE 2 Mean number of days out of role associated with Sheehan Disability Scale (SDS) role impairment ($n = 14,348$)

	None		Any		Nonsevere		Severe		F_2^a
	Mean	(SE)	Mean	(SE)	Mean	(SE)	Mean	(SE)	
Home	1.6	(0.6)	4.5	(1.1)	3.9	(0.3)	7.6	(2.0)	408.2*
Work	1.1	(0.3)	4.2	(0.3)	3.4	(0.7)	8.0	(2.3)	772.9*
Relationship	1.5	(0.4)	4.0	(0.3)	3.2	(0.7)	6.9	(1.7)	422.1*
Social	1.3	(0.5)	3.9	(0.3)	3.2	(0.7)	6.6	(1.5)	499.0*
Any	0.8	(0.4)	3.6	(0.3)	2.5	(0.5)	6.5	(1.1)	806.1*

^aTest of the association between a three-category SDS score (0, 1–6, 7–10) and number of days out of role.

*Significant at the 0.05 level, two-sided MI-corrected test.

means among students who reported severe role impairments in any of the other three role domains (6.6–7.6).

3.4 | Associations of comorbidity LCA classes with role impairment outcomes

A generally monotonic association was found between complexity of comorbidity and prevalence of SDS role impairment (Table 3). Class 1 (C1) had by far the highest prevalence of both any impairment (98%) and severe impairment (78.3%). Prevalence of both any impairment and any severe impairment were lower and roughly equal in the two other comorbid classes C2 and C3 (91.7–94.5% any; 43.4–50.0% severe) and successively lower in the pure disorder class (C4), and the classes with no 12-month disorders either in the presence (C5) or absence (C6) of lifetime disorders (81.6–55.6% any; 23.9–6.3% severe). Also, a similar generally monotonic pattern was found

between LCA classes and both probability of having any days out of role and mean number of days out of role. The highest probability of any days out of role, as well as of mean number of days out of role in the past 30 days, were in C1 (90.4%; 8.6 days). They were lower, and comparable to each other, in C2 and C3 (73.7–77.8%; 5.4–5.5 days) and successively lower in C4 (58.7%; 3.1 days), C5 (52.2%; 2.4 days), and C6 (35.4%; 1.4 days). A similar pattern is observed in each impairment domain with increasing prevalence of impairment as complexity of comorbidity, according to the defined classes, increased, and similar results are observed in classes C2 and C3.

3.5 | The joint associations of LCA classes and disorders with role impairment

We estimated multivariable models in which either LCA classes, the DSM-IV disorders underlying these classes, or both were used to

TABLE 3 Associations of latent (LCA) classes with role impairment outcomes ($n = 14,348$)^a

	Class 1 $n = 174$ (1.9%)		Class 2 $n = 676$ (5.8%)		Class 3 $n = 1,740$ (14.6%)		Class 4 $n = 2,212$ (16.1%)		Class 5 $n = 4,525$ (29.2%)		Class 6 $n = 5,021$ (32.4%)		F_5
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)	
I. Any role impairment													
Home	90.5*	(2.8)	67.2*	(2.9)	69.1*	(1.6)	51.1*	(1.9)	41.1*	(1.3)	28.9*	(1.1)	157.5*
Work	93.8*	(2.4)	83.3*	(2.1)	84.8*	(1.1)	66.4*	(1.6)	57.3*	(1.1)	38.1*	(1.1)	270.4*
Relationship	93.2*	(2.5)	80.5*	(2.2)	84.1*	(1.1)	65.8*	(1.6)	56.1*	(1.2)	36.0*	(1.1)	290.6*
Social	95.7*	(1.6)	83.5*	(2.0)	88.1*	(1.0)	70.0*	(1.5)	60.9*	(1.1)	40.4*	(1.1)	270.4*
Any	98.0	(1.1)	91.7*	(1.5)	94.5*	(0.7)	81.6*	(1.3)	77.1*	(1.0)	55.6*	(1.1)	209.7*
II. Severe role impairment													
Home	39.7*	(5.1)	13.7*	(2.3)	15.5*	(1.3)	7.1*	(0.9)	4.0*	(0.6)	1.9*	(0.4)	90.8*
Work	49.5*	(5.2)	21.9*	(2.6)	25.4*	(1.5)	9.8*	(1.0)	4.5*	(0.5)	3.0*	(0.4)	171.9*
Relationship	49.9*	(5.2)	26.9*	(2.7)	28.3*	(1.5)	12.7*	(1.1)	6.0*	(0.6)	3.2*	(0.5)	183.0*
Social	53.0*	(5.2)	23.7*	(2.6)	33.1*	(1.6)	13.3*	(1.2)	7.1*	(0.7)	3.2*	(0.4)	190.7*
Any	78.3*	(4.1)	43.4*	(3.0)	50.0*	(1.7)	23.9*	(1.4)	12.4*	(0.9)	6.3*	(0.6)	314.5*
III. Days out of role (maximum of 30) ^b													
Any Days	90.4*	(2.7)	73.9*	(2.5)	77.8*	(1.3)	58.7*	(1.6)	52.2*	(1.2)	35.4*	(1.1)	218.0*
Number of Days	8.6*	(0.7)	5.4*	(0.4)	5.5*	(0.2)	3.1*	(0.2)	2.4*	(0.1)	1.4*	(0.1)	173.6*

^aC1: High comorbidity; C2: other internalizing-externalizing comorbidity; C3: primarily internalizing comorbidity; C4: pure disorders; C5: no 12-month disorders with a lifetime history of at least one disorder; C6: no lifetime disorders.

^bEntries in the Any Days row represent the proportion of students in each class who had any days out of role in the past 30 days. Entries in the Number of Days row represent the mean number of days out of role over that time period.

*Significant at the 0.05 level, two-sided MI-corrected test.

predict SDS role impairments and days out of role controlling for country and socio-demographics. The global significance tests in models that included both sets of predictors ranged from $F_5 = 9.6$ –103.5 for classes, and $F_{1-6} = 9.0$ –65.8 for disorders, all of them being statistically significant (see Table S1). We made no attempt to evaluate interactions between classes and disorders based on a prior finding that we lacked the statistical power to do this in predicting other outcomes (Auerbach et al., 2018).

Inspection of the predictive effects of disorders in models that controlled for classes shows that the significant coefficients involving disorders were almost entirely positive (44 out of 46; Tables 4 and 5). The exception was a negative association between alcohol use disorder and social role impairment as well as with any SDS impairment (OR = 0.8, 95% CI [0.6, 0.9] and OR = 0.7, 95% CI [0.6, 0.9], respectively) suggesting the social facilitating effects of alcohol use in a college setting. Major depression was the only disorder that had significant associations with all 12 outcomes. Panic disorder had significant associations with 11 out of the 12 outcomes and ADHD with nine of the 12, followed by drug use disorder (6/12), bipolar disorder (4/12), alcohol use disorder (4/12), and generalized anxiety disorder (0/12).

The LCA classes were also significant as a set in all 12 models, with 93% (56/60) of the associations statistically significant between the five class dummy variables (compared with omitted C6) and the 12 outcomes. The significant associations of the classes with the outcomes were entirely positive, suggesting synergistic effects of comorbidity on impairments. Consistent with this interpretation, the strongest associations involved the comorbid classes (C1–C3). Most strikingly, the high-comorbidity class (C1) was

associated with odds ratios of 7.8 in predicting social role impairment, and 7.1 in predicting any work role impairment, 5.1 in predicting severe work role impairment, 10.0 in predicting severe close personal relations role impairment, and 7.1 in predicting severe social role impairment (Table 5). Other significant ORs were in the range 2.2–7.8 and were 15.5–10.3 for C1 predicting the aggregated outcomes of any SDS role impairment and severe role impairment across all role domains.

Associations of socio-demographic and college-related variables predicting role impairment outcomes are presented in Table S2.

3.6 | Population attributable risk proportions

We obtained an indication of the extent to which mental disorders influence the role functioning of students by calculating PARP (Table 6). Estimates of the proportion of any SDS role impairment that might be prevented if all students were in C6 (i.e., no lifetime disorders) were 21.4% for any role impairment, 30.1–32.8% for any impairment within SDS role domains, higher for days out of role (30.2% for any and 44.3% for number of days out of role), and much higher for severe impairment (64.6% for any and 65.5%–70.1% within SDS role domains). C3 accounted for the largest proportion of impairment, although other classes were important in absolute terms due to the larger proportions of students in those classes. In relation to the small proportion of students in C1 (1.9%), this class accounted for a higher proportion of all the impairment outcomes (7.0–9.8% of severe impairment within SDS role domains).

TABLE 4 Associations of 12-month LCA classes and underlying 12-month DSM-IV disorders with role impairment outcomes ($n = 14,348$)^a

	Any SDS role impairment		Any severe SDS role impairment		Any days out of role		Number of days out of role	
	OR	95% CI	OR	95% CI	OR	95% CI	<i>b</i>	(SE)
I. Classes								
C1	15.5*	[5.4, 44.4]	10.3*	[6.6, 16.0]	2.7*	[1.4, 5.4]	1.0	(1.3)
C2	5.9*	[4.0, 8.5]	4.0*	[3.1, 5.3]	1.8*	[1.2, 2.5]	0.3	(0.7)
C3	8.6*	[6.7, 11.1]	6.5*	[5.2, 8.0]	3.4*	[2.8, 4.1]	1.8*	(0.3)
C4	3.0*	[2.5, 3.6]	2.5*	[2.1, 3.1]	1.7*	[1.4, 2.0]	0.0	(0.3)
C5	2.6*	[2.4, 2.9]	1.9*	[1.6, 2.3]	2.0*	[1.8, 2.2]	0.7*	(0.1)
F_5	103.5*		67.5*		62.4*		16.6*	
II. Internalizing disorders								
Major depressive episode	1.8*	[1.4, 2.1]	2.2*	[1.9, 2.5]	1.7*	[1.4, 2.0]	2.0*	(0.3)
Bipolar spectrum disorder					1.9*	[1.4, 2.7]	1.4*	(0.6)
Generalized anxiety disorder								
Panic disorder	2.3*	[1.3, 4.3]	1.7*	[1.3, 2.3]	1.9*	[1.4, 2.5]	1.5*	(0.5)
III. Externalizing disorders								
Alcohol use disorder	0.7*	[0.6, 0.9]			1.4*	[1.2, 1.7]	0.7	(0.5)
ADHD			1.4*	[1.2, 1.7]	1.5*	[1.3, 1.8]	1.2*	(0.3)
Drug use disorder					1.6*	[1.2, 2.1]	2.0*	(0.7)
F_v^b	14.7*		36.2*		10.5*		9.0*	

^aBased on forward stepwise regression models that included all five latent class analysis (LCA) classes C1–C5 in addition to all individual disorders that stepped in at the 0.05 level of significance using MI-adjusted two-sided tests.

^b v = the number of mental disorders assessed in Parts II and III of the table.

*Significant at the 0.05 level, two-sided MI-corrected test.

TABLE 5 Associations of 12-month LCA classes and underlying 12-month DSM-IV disorders with role impairment outcomes ($n = 14,348$)

	Home		Work		Relationship		Social	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
I. Any role impairment								
A. Classes								
C1	2.2*	[1.0, 4.6]	7.1*	[3.9, 12.9]	3.2*	[1.6, 6.5]	7.8*	[3.8, 19.1]
C2	1.3	[0.9, 1.8]	3.9*	[3.0, 5.1]	2.4*	[1.8, 3.3]	3.5*	[2.6, 5.5]
C3	2.5*	[2.0, 3.0]	5.2*	[4.4, 6.2]	4.8*	[4.0, 5.7]	5.9*	[5.1, 7.7]
C4	1.4*	[1.2, 1.7]	2.2*	[1.9, 2.6]	2.1*	[1.9, 2.4]	2.4*	[2.1, 3.1]
C5	1.6*	[1.5, 1.9]	2.2*	[2.0, 2.4]	2.2*	[2.0, 2.4]	2.3*	[2.2, 2.6]
F_5	29.3*		90.5*		88.9*		90.8*	
B. Internalizing disorders								
Major depressive episode	1.7*	[1.5, 2.0]	1.6*	[1.3, 1.8]	2.0*	[1.7, 2.3]	2.0*	[1.6, 2.3]
Bipolar spectrum disorder	1.9*	[1.3, 2.7]			1.6*	[1.1, 2.3]		
Generalized anxiety disorder								
Panic disorder	1.8*	[1.3, 2.4]	2.3*	[1.6, 3.3]	1.9*	[1.4, 2.7]	2.3*	[1.5, 3.6]
C. Externalizing disorders								
Alcohol use disorder	1.4*	[1.1, 1.7]					0.8*	[0.6, 0.9]
ADHD	1.8*	[1.5, 2.1]	1.5*	[1.2, 1.8]	1.5*	[1.2, 1.7]	1.2	[1.0, 1.5]
Drug use disorder	2.1*	[1.5, 3.1]			1.6*	[1.1, 2.2]	1.6*	[1.1, 2.3]
F_v	12.0*		17.2*		15.6*		17.9*	
II. Severe role impairment								
A. Classes								
C1	4.7*	[2.5, 8.9]	5.1*	[3.3, 7.9]	10.0*	[6.7, 14.8]	7.1*	[4.5, 11.2]
C2	2.2*	[1.4, 3.6]	2.7*	[1.9, 3.8]	5.2*	[3.9, 7.0]	3.4*	[2.4, 4.7]
C3	3.5*	[2.4, 5.2]	4.0*	[3.1, 5.2]	6.4*	[5.0, 8.2]	6.4*	[4.9, 8.3]
C4	2.1*	[1.4, 3.1]	1.8*	[1.4, 2.3]	2.8*	[2.2, 3.6]	2.6*	[2.0, 3.4]
C5	2.0*	[1.4, 2.8]	1.4*	[1.1, 1.8]	1.8*	[1.4, 2.3]	2.2*	[1.7, 2.8]
F_5	9.6*		23.2*		54.6*		40.8*	
B. Internalizing disorders								
Major depressive episode	1.7*	[1.4, 2.2]	2.2*	[1.9, 2.7]	2.0*	[1.7, 2.3]	2.2*	[1.9, 2.6]
Bipolar spectrum disorder								
Generalized anxiety disorder								
Panic disorder	1.6*	[1.2, 2.2]	1.7*	[1.3, 2.2]			1.3*	[1.0, 1.7]
C. Externalizing disorders								
Alcohol use disorder								
ADHD	1.8*	[1.4, 2.4]	1.8*	[1.5, 2.1]			1.3*	[1.1, 1.5]
Drug use disorder	1.7*	[1.1, 2.6]						
F_v	10.2*		37.0*		65.8*		28.9*	

Based on forward stepwise regression models that included all five latent class analysis (LCA) classes C1–C5 in addition to all individual disorders that stepped in at the .05 level of significance using MI-adjusted two-sided tests.

bv: the number of mental disorders assessed in Parts II and III of the table.

*Significant at the .05 level, two-sided MI-corrected test.

4 | DISCUSSION

To the best of our knowledge, this is the first study to report on the associations of multivariate mental disorders comorbid classes with role impairment among college students in a large, cross-national sample. Three major results are worth highlighting. First, role impairment is frequent among students with mental disorders but much more so among the small fraction (1.9%) of students with high comorbidity (C1), more than three quarters of whom report severe role impairment. Moreover, the associations of mental comorbidity with role impairment outcomes follow a generally monotonic pattern. Second,

multivariable models found that both LCA classes and some individual mental disorders (most notably, major depression and panic) were significant predictors of all role impairment outcomes. Controlling for disorders, a monotonic association was found between complexity of comorbidity and role impairment. Finally, PARP analyses showed that eliminating all mental disorders could theoretically reduce severe role impairments among college students by almost two thirds, under the assumption that the observed associations are causal (Krysinika & Martin, 2009). These results suggest the need to target students with existing mental disorders for clinical interventions and students at risk of these disorders for preventive interventions.

TABLE 6 Population attributable risk proportions (PARPs) of role impairment outcomes due to each 12-month LCA class ($n = 14,348$)^a

	Class 1 (%)	Class 2 (%)	Class 3 (%)	Class 4 (%)	Class 5 (%)	Classes 1–5 (%)
I. Any role impairment						
Home	2.1	4.1	11.0	6.8	6.9	30.8
Work	1.5	3.8	10.3	6.9	8.8	31.3
Relationship	1.5	3.7	10.8	7.4	9.4	32.8
Social	1.3	3.3	9.7	6.8	9.1	30.1
Any	0.8	2.1	6.3	4.8	7.5	21.4
II. Severe role impairment						
Home	9.8	9.2	27.6	11.4	8.3	66.4
Work	8.5	10.5	32.3	10.3	3.8	65.5
Relationship	7.1	11.1	30.7	12.3	6.4	67.6
Social	7.0	8.8	33.8	12.1	8.4	70.1
Any	5.9	9.5	29.1	12.4	7.6	64.6
III. Days out of role (maximum of 30)^b						
Any days	1.8	3.7	10.1	6.4	8.3	30.2
Number of days	4.1	6.8	18.2	7.9	7.2	44.3

^aPARPs were calculated across all 20 multiply imputed data sets combined and should be interpreted as average values across these datasets. The models used to calculate PARPs controlled for country and socio-demographics.

^bThe percentages represent the expected reductions in numbers of days out of role as a percentage of total number of currently observed days out of role in the full sample.

In a previous study, we reported a strong association between mental disorders and role impairment (Alonso et al., 2018). This association was strongest for social life, close personal relationships, and work domains, and in particular in the case of major depressive episode and generalized anxiety disorder. In that study, the number of comorbid mental disorders was associated with a higher likelihood of role impairment, but in multivariable models, the relationship between comorbidity and impairment was subadditive; that is, for a person within a given mental disorder, a comorbid disorder would add impairment but less so than it would be expected if the latter disorder happened alone. Results presented here show that the association of comorbidity classes with role impairments is also monotonic, with the class characterized by highest comorbidity showing the highest level of impairment, the other comorbid classes (either predominantly internalizing or mixed internalizing and externalizing) having intermediate levels of impairment, the class characterized by pure disorders having lower impairments, and the classes with no disorders having the lowest impairments. These results, coupled with the finding reported by Auerbach et al. (2018) of comparable associations of disorder classes with suicidal ideation and behaviors, suggest that LCA class membership would be a useful marker of risk to use in targeting clinical interventions for students.

It is also important to note that several disorders were associated with variation in role impairment net of the effects of class. Impairments were most consistently associated with major depression, panic disorder, and ADHD after adjusting for class membership. This association is consistent with evidence for the special importance of these disorders in previous surveys among students (Verger et al., 2010) as well as in the general population (Comer et al., 2011; Edlund et al., 2018). However, the LCA showed that substantial proportions of the students with these disorders also had other diagnoses, making it important to consider the use of trans-diagnostic approaches in treating these students (Barlow et al., 2017). The high prevalence of students with multiple mental disorders creates a

challenge for delivery of these or other treatments. As discussed in a number of the other papers in this special issue, the existence of inexpensive evidence-based online interventions with proven effectiveness could help address this problem (Cuijpers, Kleiboer, Karyotaki, & Riper, 2017; Ebert et al., 2018). This approach could be of special value among college students, who have ready access to, and familiarity with, computers and given their low levels of use of conventional mental health services (Bruffaerts et al., under review; Thorley, 2017).

4.1 | Strengths and limitations

An important strength of our study is that it was based on a large sample that included students across eight different countries. Pooling across these different countries was facilitated by using a consistent methodology as well as highly standardized data management and analysis procedures. Nevertheless, our findings should be considered in light of several limitations.

First, the response rates were low in several sites, although these response rates compare favorably to those achieved in other large-scale college student surveys (39–44%; Eisenberg, Hunt, & Speer, 2013; Paul, Tsypes, Eidlitz, Ernhout, & Whitlock, 2015). Although it has been shown that the empirical relationship between response rate and nonresponse bias is weak (Groves, 2006), recent findings warn of potential overestimation of mental disorders when response rates are low (Mortier et al., 2018). In addition, the colleges and universities we surveyed were convenience samples rather than nationally representative samples of incoming first-year students, which may limit the representativeness of the data.

Second, data are not available on the validity of diagnostic assessments even though, as noted in Section 2.3, diagnoses of 12-month prevalence of the seven core disorders based on screening scales have

shown good concordance with diagnoses based on blinded semistructured clinical interviews in other populations. In addition, the very brief screens for lifetime binge-eating disorder, intermittent explosive disorder, and post-traumatic stress disorder have never been validated. Our assumption that none of these lifetime disorders was active in the 12 months before the survey is almost certainly inaccurate, leading to some misclassification of comorbidity classes. This also accounts for discrepancies in the proportion of students estimated to have lifetime disorders here compared with those in an earlier report (Auerbach et al., 2018). This omission has been corrected in the more recent version of the survey that is currently being administered, and we should be able to estimate if misclassification bias in our analyses is of any importance.

Third, we used an adapted version of the SDS. The original scale was targeted for individuals with mental disorders and asked specifically about the impairment caused by such conditions (Klemenc-Ketis, Kersnik, Eder, & Colaric, 2011). The modified scale used in our study did not differentiate between physical and mental health. This may have led us to attribute impairment related to physical health to the presence of mental disorders. However, bias should be small given that impairment of mental disorders as measured by the SDS tends to be considerably higher than that of physical conditions (Ormel et al., 2008). Nonetheless, additional analyses taking into account the presence of physical disorders could help better estimate those effects.

Finally, the LCA was based on the assumption that true underlying classes exist that lead the disorders to be conditionally independent within classes. If this assumption is incorrect, it might be that other methods would yield more useful characterizations of the multivariate profiles among disorders. This possibility needs to be investigated in future analyses of the WMH-ICS data.

5 | CONCLUSIONS

This online survey of first-year college students in eight countries revealed strong associations of mental disorders with role impairment outcomes, especially severe impairment, with magnitudes in terms of population attributable risk that were very comparable for all four role domains we considered. The LCA results showed that comorbidity had special importance in predicting severe role impairment, suggesting that the classes defined by the existence of comorbidity might be useful as markers of need for treatment. The high prevalence of comorbid mental disorders among college students creates a challenge for treatment. Innovative e-therapies are available that might be useful in diminishing role impairment among university college students.

ACKNOWLEDGMENTS

Funding to support this initiative was received from the National Institute of Mental Health (NIMH) R56MH109566 (R. P. A.), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or NIMH; the Belgian Fund for Scientific Research (11N0514N/11N0516N/1114717N; P. M.), the King Baudouin Foundation (2014-J2140150-102905; R. B.), and Eli Lilly (IIT-H6U-BX-1002; R. B. and P. M.); BARMER, a health care insurance company, for project StudiCare (DDE); ZonMw

(Netherlands Organisation for Health Research and Development; Grant 636110005) and the PFGV (PFGV; Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (PC); South African Medical Research Council and the Ithemba Foundation (DJS); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440), Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya (2017 SGR 452), FPU (FPU15/05728); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER (PI13/00506); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (TB); Consejo Nacional de Ciencia y Tecnología (CONACyT) Grant CB-2016-01-285548 (C. B.). The WMH-ICS Initiative is carried out as part of the WHO World Mental Health (WMH) Survey Initiative. The WMH survey is supported by the National Institute of Mental Health NIMH R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (RCK). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

CONFLICTS OF INTEREST

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research.

Dr. Ebert reports to have received consultancy fees/served in the scientific advisory board from several companies such as Minddistrict, Lantern, Schoen Kliniken, and German health insurance companies (BARMER, Techniker Krankenkasse). He is also stakeholder of the Institute for Health Training Online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care.

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ROLE OF FUNDING

The funding sources had no role in the design and conduct of the study; collection, management, analysis, interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Alonso J, Vilagut G, Mortier P, et al. The role impairment associated with mental disorder risk profiles in the WHO World Mental Health International College Student Initiative. *Int J Methods Psychiatr Res*. 2019;28:e1750. <https://doi.org/10.1002/mpr.1750>

SPECIAL ISSUE

Lifetime and 12-month treatment for mental disorders and suicidal thoughts and behaviors among first year college students

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Funding information

Ministerio de Sanidad, Servicios Sociales e Igualdad, Grant/Award Number: 2015I015; Bristol-Myers Squibb; GlaxoSmithKline; Ortho-McNeil Pharmaceutical; Eli Lilly and Company; Pan American Health Organization; Fogarty International Center, Grant/Award Number: R03-TW006481; US Public Health Service, Grant/Award Numbers: R01 DA016558, R01-MH069864 and R13-MH066849; Pfizer Foundation; John D. and Catherine T. MacArthur Foundation; National

Abstract

Objectives: Mental disorders and suicidal thoughts and behaviors (STB) are common and burdensome among college students. Although available evidence suggests that only a small proportion of the students with these conditions receive treatment, broad-based data on patterns of treatment are lacking. The aim of this study is to examine the receipt of mental health treatment among college students cross-nationally.

Methods: Web-based self-report surveys were obtained from 13,984 first year students from 19 colleges in eight countries across the world as part of the World Health Organization's World Mental Health-International College Student Initiative. The survey assessed lifetime and 12-month common mental disorders/STB and treatment of these conditions.

Institute of Mental Health, Grant/Award Number: R01MH070884; Consejo Nacional de Ciencia y Tecnología, Grant/Award Number: CB-2016-01-285548; Ulster University; Northern Ireland Public Health Agency; European Union Regional Development Fund; FPU, Grant/Award Number: FPU15/05728; DIUE Generalitat de Catalunya, Grant/Award Number: 2017 SGR 452; ISCIII, Grant/Award Numbers: CD12/00440 and CM14/00125; Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER, Grant/Award Numbers: PI13/00506 and PI13/00343; Ithemba Foundation; South African Medical Research Council; Protestants Fonds voor de Geestelijke Volksgezondheid; ZonMw, Grant/Award Number: 636110005; BARMER; Eli Lilly, Grant/Award Number: IIT-H6U-BX-1002; King Baudouin Foundation, Grant/Award Number: 2014-J2140150-102905; Belgian Fund for Scientific Research, Grant/Award Number: 11N0514N/11N0516N/1114717 N; National Institute of Mental Health (NIMH), Grant/Award Number: R56MH109566

Results: Lifetime and 12-month treatment rates were very low, with estimates of 25.3–36.3% for mental disorders and 29.5–36.1% for STB. Treatment was positively associated with STB severity. However, even among severe cases, lifetime and 12-month treatment rates were never higher than 60.0% and 45.1%, respectively.

Conclusions: High unmet need for treatment of mental disorders and STB exists among college students. In order to resolve the problem of high unmet need, a reallocation of resources may focus on innovative, low-threshold, inexpensive, and scalable interventions.

KEYWORDS

affective disorders, anxiety, college students, health service, suicide

1 | INTRODUCTION

Mental disorders are common and impairing conditions among college students worldwide, with 12-month estimates of 1/5 to 1/3 meeting criteria for a diagnostic and statistical manual, fourth edition (DSM-IV) mental disorder (Auerbach et al., 2016, in press). Mental disorders are often associated with suicidal thoughts and behaviors (STB; including suicidal ideation, plans, and attempts); prior studies indicate that mental disorders are associated with a threefold to fourfold increased risk in STBs (Nock et al., 2008). Mental disorders and/or STB among students specifically are associated with adverse outcomes such as lower academic functioning (Bruffaerts et al., 2018), relationship dysfunction (Kerr & Capaldi, 2011), or labor market marginalization (Niederkrötenhaler et al., 2017). These long-term adverse outcomes may be mediated by mental health problems that exist during the college years, as these years constitute a peak period for the first onset of a broad range of mental disorders. Over the past decades, a number of college prevention programs have been established to reduce the high burden of emotional problems; however, these programs generally shown small effect sizes (Harrod, Goss, Stallones, & DiGuseppi, 2014; Reavley & Jorm, 2010). Further, a number of psychological treatments have clearly demonstrated the ability to treat mental disorders and STB (Cuijpers et al., 2016; Linehan et al., 2006); yet available data suggest that many students with mental disorders or STB rarely seek treatment (Auerbach et al., 2016; Eisenberg, Hunt, Speer, & Zivin, 2011; Han et al., 2016). Among U.S. college students with 12-month mental disorders, as few as 18% report having used mental health services in the past year (Blanco et al., 2008) and another study of U.S. college students found that only 51% of students with suicidal ideation received any type of treatment in the past year (Downs & Eisenberg, 2012). Low treatment rates in college are counterintuitive, as treatment seeking is higher among younger people (Wang et al., 2007), and importantly, many colleges have a student health center or

other facilities that provide low-threshold access to professional care (McBride, Van Orman, Wera, & Leine, 2013).

Although available data suggest that the treatment gap for mental disorders and STB is high among college students, these prior studies have several limitations. First, most studies are confined to a limited number of countries such as the United States (Eisenberg et al., 2011), China (Liu et al., 2017), Northern Ireland (McLafferty et al., 2017), or France (Verger, Guagliardo, Gilbert, Rouillon, & Kovess-Masfety, 2010). Second, many studies restrict their samples to specific college departments (e.g., psychology and medicine—Sun et al., 2017). Third, and critically, the vast majority of studies have not assessed lifetime treatment (for an exception, see Arria et al., 2011), thereby confounding whether students first entered treatment prior to or after arrival at college.

2 | METHODS

The current report used data collected in the WHO World Mental Health International College Student (WMH-ICS) Initiative (http://www.hcp.med.harvard.edu/wmh/college_student_survey.php). The WHO-ICS was initiated to obtain accurate longitudinal information about the prevalence and correlates of mental, substance, and behavioral disorders among college students throughout the world. The initial phase of the initiative, which is the focus of the current report, involves carrying out surveys with incoming first year college students to estimate prevalence of mental disorders, associated impairments, adverse social and academic consequences, and patterns of help seeking. The specific aims of the current report are to (a) estimate the proportion of respondents with either lifetime or 12-month mental disorders and/or STB who received some form of treatment; (b) examine the types of disorders and levels of STB most likely to receive treatment; and (c) examine multivariate socio-demographic and college-related correlates of treatment.

2.1 | Samples

The WMH-ICS surveys were administered in a convenience sample of 19 colleges and universities (seven private, 12 public; henceforth referred to as “colleges”) in eight countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Web-based self-report questionnaires were administered to representative samples of incoming freshmen across these countries between October 2014 and February 2017. A total of 14,371 questionnaires were completed, with sample sizes ranging from a low of 633 in Australia to a high of 4,580 in Belgium. The weighted (by achieved sample size) mean response rate across all surveys was 45.5%. An overview of the sample design in each participating country is provided in Data S1. The sample for the analyses reported here was restricted to students identifying as male or female who were full-time students ($n = 13,984$). Students excluded from analyses included those with missing information on gender and full-time status ($n = 35$), who did not identify as male or female ($n = 50$), or who reported part-time status ($n = 302$).

2.2 | Procedures

All incoming freshmen were invited to participate in a web-based self-report health survey. The initial mode of contact varied across colleges. The survey was part of a health evaluation in some colleges, part of the registration process in others, and a stand-alone survey administered to students via their student email addresses in still others. In all cases other than in Mexico, potential respondents were invited to participate and initial nonrespondents were recontacted through a series of personalized reminder emails containing unique electronic links to the survey. The situation was different in Mexico, where students were invited to participate in conjunction with mandatory activities, which varied from school to school (e.g., student health evaluations and tutoring sessions), with time set aside for completing the survey during the sessions. In the other countries, 10 colleges implemented conditional incentives in the final stages of refusal conversion (e.g., a raffle for store credit coupons and movie passes). In addition, one site (Spain) used an “end-game strategy” in which a random sample of nonrespondents at the end of the normal recruitment period was offered incentives for participation. Respondents to these end-game interviews given a weight equal to $1/p$, where p represented the proportion of nonrespondents at the end of the normal recruitment period that was included in the end game, to adjust for the undersampling of these hard-to-recruit respondents. Informed consent was obtained before administering the questionnaires in all countries. Procedures for obtaining informed consent and protecting human participants were approved and monitored for compliance by the institutional review boards of the organizations coordinating the surveys in each country.

2.3 | Measures

2.3.1 | Seeking professional treatment for mental disorders

All respondents were asked whether they ever got psychological counseling or medication for an emotional or substance problem,

as well as the age of the first and last time they received medication or counseling (Hoge et al., 2004; Kessler & Ustun, 2004; Ursano, 2012).

2.3.2 | Mental disorders

Due to the size and logistical complexities of the surveys, it was impossible to administer an in-depth psychiatric diagnostic interview to each student. Instead, the survey instrument consisted of a broad range of short validated self-report screening scales. These included the CIDI Screening Scales (Kessler et al., 2013; Kessler & Ustun, 2004) for lifetime and 12-month major depressive episode, mania/hypomania, generalized anxiety disorder (GAD), panic disorder, and drug use disorder (abuse or dependence either on cannabis, cocaine, or any other street drug, or on a prescription drug either used without a prescription or used more than prescribed to get high, buzzed, or numbed out) and the AUDIT screening scale for alcohol use disorder (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The CIDI-SC scales have concordance with blinded clinical diagnoses in the range area under the curve (AUC) = 0.70–0.78 (Kessler et al., 2013). In line with a prior recommendation (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), we defined alcohol use disorder (abuse or dependence) in the AUDIT as either having a total score of 16+ or a score 8–15 with 4+ on the AUDIT dependence questions. This version of AUDIT scoring has concordance with clinical diagnosis in the range AUC = 0.78–0.91 (Reinert & Allen, 2002). Additional items taken from the CIDI (Kessler & Ustun, 2004) were used to assess age of onset of each disorder and number of months with symptoms in the past year. Please note that validation studies of our self-report screening scales have not yet been carried out in samples of college students.

2.3.3 | Suicidal thoughts and behaviors

A modified version of the Columbia Suicidal Severity Rating Scale (Posner et al., 2011) was used to assess STB, including suicidal ideation (“Did you ever wish you were dead or would go to sleep and never wake up?” and “Did you ever in your life have thoughts of killing yourself?”), suicide plans (“Did you ever think about how you might kill yourself [e.g., taking pills, shooting yourself] or work out a plan of how to kill yourself?”), and suicide attempts (“Have you ever made a suicide attempt [i.e., purposefully hurt yourself with at least some intent to die]?”). Among those who indicated to have had lifetime STB, we also asked whether this occurred in the past 12 months.

2.3.4 | Socio-demographic predictors

Gender was assessed by asking respondents whether they identified themselves as male, female, transgender (male-to-female/female-to-male), or “other.” Respondent age was categorized into three categories (18 years/19 years/20 or more years old). Parental educational level was assessed for father and mother separately and was categorized into high (university graduate or more), medium (some

postsecondary education), and low (secondary school or less) based on the highest-of-both parents' educational level. Parental marital status was dichotomized into "parents not married or parent(s) deceased" versus "parents married and both alive." Respondents were asked about the urbanicity of the place they were raised (small city/large city/town or village/suburbs/rural area) and their religious background (categorized into Christian/Other religion/No religion). Sexual orientation was classified into the categories heterosexual; gay or lesbian, bisexual, asexual, not sure, and other. Additional questions were asked about the extent to which respondents reported being attracted to men and women and the gender(s) of people they had sex with (if any) in the past 5 years. Respondents were categorized into the following categories: heterosexual with no same-sex attraction, heterosexual with some same-sex attraction, nonheterosexual without same-sex sexual intercourse, and nonheterosexual with same-sex sexual intercourse.

2.3.5 | College-related predictors

Respondents were asked where they ranked academically compared with other students at the time of their high school graduation (from top 5% to bottom 10%; categorized into quartiles) and what their most important reason was for going to a university. Based on the results of a tetrachoric factor analysis (details available on request), the most important reason to go to a university was categorized into extrinsic reasons (i.e., "family wanted me to," "my friends were going," "teachers advised me to," and "I did not want to get a job right away") versus intrinsic reasons ("to achieve a degree," "I enjoy learning and studying," "to study a subject that really interests me," "to improve job prospects generally," and "to train for specific type of job"). Respondents were also asked where they were living during the first semester of the academic year (parents', other relative's, or own home/university or college hall of residence/shared house, apartment, or flat/private hall of residence/other) and if they expect to work in a student job.

2.4 | Analysis

All analyses were conducted with SAS version 9.4 (SAS Institute Inc., 2010). Data were weighted to adjust for differences between survey respondents and nonrespondents on whatever socio-demographic information was made available about the student body by university officials using poststratification weights (Groves & Couper, 1998). Item-level missing data in the completed surveys were imputed using the method of multiple imputation (MI) by chained equations (Van Buren, 2012). Four kinds of item-missing data were imputed simultaneously in this way. The first was a 50% random subsampling of the drug use section in Belgium, which was done to reduce interview length. The second was the complete absence of the panic disorder section in Mexico, Northern Ireland, and South Africa due to a skip logic error. The third was the complete absence of some socio-demographic variables in Australia, Belgium, and Spain because of a decision by school administrators not to assess those variables (sexual orientation, current living situation, expected

student job, and most important reason for going to college in all these countries; parent education and marital status in Australia and Belgium; religion in Australia; and self-reported high school ranking in Belgium). The fourth was item-level skips or invalid responses to individual questions throughout the survey. The latter was less than 0.1% for lifetime disorders, 0.0–2.3% for 12-month disorders other than AUD, and in the range 3.0–9.3% (3.8–7.0% interquartile range) for AUD, 0.0–12.0% (interquartile range 1.9–2.7%) for disorder age-of-onset, 0.0–24.6% (interquartile range 2.4–8.8%) for disorder persistence, 1.8–25.4% (interquartile range 8.8–24.1%) for most important reasons for attending college, 1.0–10.8% (interquartile range 3.0–3.4%) for high school ranking, and 0.0–7.0% for the other socio-demographic and college-related variables. Cross tabulations were used to estimate the prevalence of treatment seeking among those with 12-month mental disorder and STB and are reported as weighted within-country proportions, with associated MI-adjusted standard errors obtained through the Taylor series linearization method. To obtain pooled estimates of prevalence across countries, each country was given an equal sum of weights.

Logistic regression analyses were used to identify mental disorders, number of mental disorders, and STB as predictors for treatment seeking, both lifetime and 12-month. Both bivariate (in which only one predictor was considered at a time) and multivariate analyses (in which all predictors were considered simultaneously) were performed; all analyses additionally adjusted for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, and most important reason to go to university), and country membership. A series of multivariate models was evaluated including combinations of the following predictor blocks: (a) separate dummy variables for each of the six types of mental disorder, (b) a variable indicating number of mental disorders (ranging from zero to six), (c) dummy variables indicating exactly one, exactly two, and three or more mental disorders, and (d) type of STB. This approach allowed us to investigate whether treatment seeking is best explained by additive models (including only type of mental disorders and/or STB) or interactive models (including type of mental disorders and/or STB, as well as the *number* of disorders). Akaike's information criterion and AUC were used to select the final and best-fitting models. Regression coefficients and their MI-based standard errors were exponentiated to create odds ratios (ORs) and associated 95% confidence intervals.

All results were pooled across countries using a fixed effects modeling (FEM) approach by including dummy control variables for country. Due to variable within-country sample sizes, no attempt was made to search for variation in associations across countries. We chose FEM instead of a multilevel modeling approach to account for the nested structure of the data because our focus is on pooled within-group associations between individual-level predictors and outcomes rather than geographic variation in mean outcome scores. In a situation of this sort, FEM is preferable because it yields estimates of individual-level associations

comparable with multilevel analysis without the restrictive, and in our case incorrect, assumption in the latter approach that the aggregate units (i.e., countries and universities within countries) represent random samples from the population of all such units (Goldstein, 2010).

Finally, we estimated bivariate and multivariate models with socio-demographic variables, college-related variables, and country membership as predictors for seeking treatment, adjusting for the predicted probabilities. This enabled us to estimate the effect of the socio-demographic and college-related predictors on seeking treatment above and beyond the clinical likelihood of seeking treatment. In addition, we tested all two-way interactions between the predicted probabilities on the one hand and socio-demographic variables, college-related variables, and country membership on the other hand. Statistical significance in all analyses was evaluated using two-sided MI-based tests with significance level α set at 0.05.

3 | RESULTS

3.1 | Socio-demographic description of the sample and students' expectations for college

The final sample included 13,984 students (58.4% female; mean age = 19.33, $SD = 0.59$). Most of the students have highly educated parents (57.2%) and identify as Christian (57.3%).

3.2 | Lifetime and 12-month prevalence of mental disorders and STB

As reported in previous WMH-ICS publications (Auerbach et al., 2018; Mortier et al., 2018) and in a prior report in this issue (Auerbach et al., 2018), around one third of participants met criteria for lifetime mental disorder (mostly major depressive episode [MDE] [21.2%] or

TABLE 1 Treatment^a of mental disorders and suicidal thoughts and behaviors (STB) in the WMH-ICS ($n = 13,984$)

Category	Lifetime		12-Month	
	Prevalence % (SE)	Treatment % (SE)	Prevalence % (SE)	Treatment % (SE)
Full sample	100.0 (0.0)	19.8 (0.5)	100.0 (0.0)	11.3 (0.4)
Mental disorders and STB				
Any mental disorder ^b	35.3 (0.6)	36.3 (1.1)	31.4 (0.6)	25.3 (1.1)
Any STB ^c	32.7 (0.6)	36.1 (1.2)	17.2 (0.5)	29.5 (1.6)
Any mental disorder and any STB	20.6 (0.5)	47.0 (1.6)	11.7 (0.4)	37.7 (2.1)
Any mental disorder or any STB	47.5 (0.6)	31.5 (0.9)	36.9 (0.6)	23.3 (1.0)
Any mental disorder and no STB	14.8 (0.5)	21.3 (1.4)	19.7 (0.5)	17.9 (1.2)
Any STB and no mental disorder	12.2 (0.4)	17.8 (1.5)	11.7 (0.4)	37.7 (2.1)
No mental disorder or STB	52.5 (0.6)	9.1 (0.5)	63.1 (0.6)	4.2 (0.3)
Type of mental disorder				
Major depressive episode	21.2 (0.5)	43.2 (1.5)	18.5 (0.5)	30.2 (1.5)
Generalized anxiety disorder	18.6 (0.5)	45.0 (1.6)	16.7 (0.5)	32.6 (1.6)
Panic disorder	5.0 (0.3)	59.8 (3.3)	4.5 (0.3)	42.0 (3.8)
Broad mania	3.5 (0.2)	41.0 (3.6)	3.1 (0.2)	25.8 (3.5)
Alcohol abuse or dependence	6.8 (0.3)	29.4 (2.5)	6.3 (0.3)	19.8 (2.4)
Drug abuse or dependence	5.1 (0.3)	42.4 (3.5)	3.0 (0.2)	32.6 (4.2)
Number of disorders				
None	64.7 (0.6)	10.7 (0.5)	68.6 (0.6)	4.8 (0.4)
Exactly one mental disorder	18.4 (0.5)	24.1 (1.4)	17.2 (0.5)	16.2 (1.2)
Exactly two mental disorders	11.0 (0.4)	44.0 (2.1)	9.4 (0.4)	33.1 (2.2)
Three or more mental disorders	5.8 (0.3)	60.0 (3.0)	4.8 (0.3)	42.3 (3.4)
STB				
Never	67.3 (0.6)	11.8 (0.5)	82.8 (0.5)	7.5 (0.4)
Ideation only	14.8 (0.5)	24.5 (1.5)	8.4 (0.4)	19.9 (1.9)
Plan, no attempts	13.6 (0.5)	41.9 (1.9)	7.8 (0.4)	37.8 (2.6)
Planned or unplanned attempt	4.3 (0.3)	57.5 (3.4)	1.0 (0.1)	45.1 (7.0)

Note. To obtain pooled estimates of prevalence, each country was given an equal sum of weights. SE: standard error.

^aRespondents with age of last treatment lower than the minimum age of onset across the six mental disorders and suicidal outcomes under study ($n = 174$; 1.2% of the full sample) are coded as not having received treatment.

^bAny out of the six types of mental disorders under study.

^cAny out of the three STB outcomes under study.

GAD [18.6%]—Table 1) or reported lifetime STB (mostly suicidal ideation [14.8%]). Approximately one student in five had both STB and mental disorder in their lifetime; whereas approximately half of the students never experienced any mental disorder nor STB. If we look at prevalence estimates in the past 12 months (Table 1), a similar picture emerges: Almost a third of the students meet criteria for a mental disorder (mostly MDE [18.5%] or GAD [16.7%]), with STB being remarkably less common (estimates between 1.1% and 8.4%). Around one in 10 have both STB and mental disorders in the past year, and around six in 10 do not meet criteria for a mental disorder or STB. More detailed information on the occurrence of mental disorder and STB in the sample can be found in Auerbach et al. (2018) and Mortier et al. (2018) or in the earlier paper in this special issue (Auerbach et al., 2018).

3.3 | Lifetime treatment rates for mental disorders and STB

An average of 19.8% of the total WMH-ICS sample had used services for emotional problems or substance use-related problems ever in their life (Table 1). Approximately 36% of students with any life mental disorder and a similar proportion (i.e., 36.1%) who engaged in STB at some time in the past received some form of treatment for emotional problems in the past year. The estimate of lifetime treatment among those without a lifetime disorder or STB was 9.1%. Those with higher severity accessed care at higher rates. For example, 60.0% of those with three or more lifetime mental disorders reported lifetime treatment, compared with 24.5% among those with one lifetime mental disorder. If we look at types of disorders, panic disorder (59.8%) and GAD (45.0%) were the disorders that yielded the highest lifetime treatment rates among college students. Lowest treatment rates were found among students with alcohol abuse or dependence (29.4%). Similarly, lifetime treatment rates for STB were estimated in the 24.5–41.9% range for those with suicidal thoughts (i.e., suicide ideation or plan) and 57.5% of those who made a suicide attempt.

3.4 | Bivariate and multivariate correlates of lifetime treatment

In bivariate models (Table 2), all mental disorders (median OR = 3.3) and all STB (median OR = 4.3) were associated with increased odds of lifetime treatment. Specifically, suicide attempt and panic disorder were strongly related to lifetime treatment (OR > 5). The best-fitting regression model to predict lifetime treatment was the multivariate additive model that includes both type of mental disorder and STB, but not number of disorders (Table 2, Multivariate Model 4). In this model, it is clear that both mental disorders (median OR = 2.1) and STB (median OR = 2.6) were directly related to increased odds of receiving treatment. The individual disorder most strongly related to lifetime treatment was panic disorder (OR = 2.9); for STB, this was suicide attempt (OR = 3.4). Remarkably, although we found a clear gradient between the number of mental disorders and lifetime treatment in bivariate models, this effect lost statistical significance in multivariate models. This suggests that having multiple disorders (vs. only one disorder) does not convey a subadditive synergistic effect on seeking treatment.

We also investigated multivariate socio-demographic predictors of lifetime treatment (among those with lifetime disorders or lifetime STB—Table 3) and found that being 20 or older (OR = 1.8), being female (OR = 1.4), having parents who were either not married or where one of the parents deceased (OR = 1.6), or nonheterosexual oriented without same-sex intercourse (OR = 1.4) systematically increased the odds of receiving treatment. Students with lifetime mental disorders and/or STB whose parents had low educational attainment were significantly less likely to seek help (OR = 0.6). College-related factors were not significantly associated with lifetime treatment nor was religious affiliation. None of the two-way interactions between the predicted probabilities and socio-demographic correlates reached statistical significance (results available on request); *F*-test evaluating the model including two-way interactions versus the reduced model without interactions *F* (ndf,ddf)[*p* value] = 0.99 (31,136)[0.50].

3.5 | 12-Month treatment rates for mental disorders and STB

Table 1 shows that an average of 11.3% of the total WMH-ICS sample had used services in the past year, with higher rates for those with disorders/STB: 25.3% of students with any 12-month mental disorder and 29.5% who engaged in STB in the past year received some form of treatment in the same time span. The estimate of treatment among those without a 12-month disorder or STB was 4.2%. Similar to what we found for lifetime treatment, those with higher severity accessed care at higher rates. For example, 42.3% of those with three or more 12-month mental disorders reported 12-month treatment, compared with only 16.2% among those with one mental disorder. Students with panic disorder (42.0%), GAD (32.6%) but also drug abuse/dependence (32.6%) report the highest treatment rates, those with alcohol abuse/dependence the lowest (19.8%). Similarly, treatment rates for STB were estimated in the 19.9–37.8% range for those with suicidal thoughts (i.e., suicide ideation or plan) but were higher (i.e., 45.1%) in those who made a suicide attempt.

3.6 | Bivariate and multivariate predictors of 12-month treatment

In bivariate models (Table 4), all mental disorders (median OR = 4.4) and all STB within the past year (median OR = 5.3) were associated with receiving treatment in the same time span. Specifically, suicide attempt (OR = 8.2) and GAD (OR = 5.4) yielded the highest odds for treatment. The best-fitting regression model for 12-month treatment was the multivariate interactive model including both type of mental disorder and number of mental disorders, as well as STB, resulting in multivariate median ORs of 3.2 for mental disorders and 2.5 for STB. Interestingly, in bivariate models, we observed a clear gradient between the number of mental disorders and receiving treatment, but the multivariate models suggest a subadditive effect, that is, a (borderline significant) *negative* trend between number of disorders and seeking treatment (*F* = 2.99 (2,272), *p* = 0.05). Interestingly,

TABLE 2 Lifetime mental disorders and lifetime suicidal thoughts and behaviors (STB) as predictors for lifetime treatment^a

Category	Prevalence ^b % (SE)	Lifetime treatment				
		Bivariate ^c aOR [95% CI]	Multivariate 1 ^d aOR [95% CI]	Multivariate 2 ^d aOR [95% CI]	Multivariate 3 ^d aOR [95% CI]	Multivariate 4 ^d aOR [95% CI]
Type of lifetime mental disorder						
Major depressive episode	21.2 (0.5)	4.2 [3.6, 4.7]*	2.7 [2.3, 3.1]*	2.8 [2.3, 3.4]*	2.7 [2.3, 3.3]*	2.0 [1.8, 2.4]*
Generalized anxiety disorder	18.6 (0.5)	4.1 [3.6, 4.7]*	2.3 [1.9, 2.7]*	2.4 [2.0, 3.0]*	2.3 [1.8, 2.9]*	2.1 [1.8, 2.5]*
Panic disorder	5.0 (0.3)	5.1 [3.8, 6.9]*	3.0 [2.2, 4.2]*	3.2 [2.2, 4.7]*	3.1 [2.1, 4.6]*	2.9 [2.1, 3.9]*
Broad mania	3.5 (0.2)	2.3 [1.8, 2.9]*	1.0 [0.7, 1.3]	1.0 [0.7, 1.4]	1.0 [0.7, 1.5]	0.8 [0.6, 1.1]
Alcohol abuse or dependence	6.8 (0.3)	1.4 [1.1, 1.7]*	1.0 [0.8, 1.3]	1.1 [0.8, 1.4]	1.1 [0.8, 1.4]	1.0 [0.8, 1.3]
Drug abuse or dependence	5.1 (0.3)	2.4 [1.9, 3.1]*	1.9 [1.4, 2.5]*	2.0 [1.5, 2.8]*	2.0 [1.4, 2.7]*	1.8 [1.3, 2.4]*
<i>F</i> (ndf,ddf)[<i>p</i> value] ^e			98.19 (6,782) [<0.01]*	29.81 (6,310) [<0.01]*	27.84 (6,349) [<0.01]*	59.74 (6,477) [<0.01]*
Number of lifetime disorders (con.)		2.1 [1.9, 2.2]*		0.9 [0.8, 1.1]		
Number of lifetime disorders (cat.)						
None	64.7 (0.6)	(Ref)			(Ref)	
Exactly one mental disorder	18.4 (0.5)	2.2 [1.9, 2.6]*				
Exactly two mental disorders	11.0 (0.4)	5.2 [4.4, 6.2]*			1.0 [0.7, 1.4]	
Three or more mental disorders	5.8 (0.3)	9.2 [7.1, 12.1]*			0.9 [0.5, 1.5]	
<i>F</i> (ndf,ddf)[<i>p</i> value] ^f		173.02 (3,542) [<0.01]*			0.25 (2,350)[0.78]	
Lifetime STB						
Never	67.3 (0.6)	(Ref)				(Ref)
Ideation only	14.8 (0.5)	2.2 [1.9, 2.6]*				1.7 [1.4, 1.9]*
Plan, no attempts	13.6 (0.5)	4.3 [3.6, 5.1]*				2.6 [2.2, 3.2]*
Planned or unplanned attempts	4.3 (0.3)	6.5 [5.0, 8.3]*				3.4 [2.5, 4.5]*
<i>F</i> (ndf,ddf)[<i>p</i> value] ^f		144.43 (3,4303) [<0.01]*				46.65 (3,1080) [<0.01]*
Model fit						
Akaike information criterion			10,880.9	10,881.4	10,882.9	10,679.2
Area under the curve			0.754	0.754	0.754	0.764

Note. aOR: adjusted odds ratio; cat.: categorical; CI: confidence interval; con.: continuous; SE: standard error.

^aRespondents with age of last treatment lower than the minimum age of onset across the six mental disorders and suicidal outcomes under study are coded as not having received treatment.

^bTo obtain pooled estimates of prevalence, each country was given an equal sum of weights.

^cBivariate models adjust for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, and most important reason to go to university), and country membership.

^dMultivariate models adjust for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, and most important reason to go to university), country membership, and for predictors shown in the rows.

^e*F*-test to evaluate joint significance of six types of mental disorders. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

^f*F*-test to evaluate joint significance of categorical predictor levels. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

students with three or more mental disorders had 60% lower odds of treatment (Table 4).

The multivariate socio-demographic predictors of treatment among those with 12-month disorders or 12-month STB (Table 5) show that the strength of the ORs is moderate, with being female (OR = 1.6), being 20 or older (OR = 1.5), not having a religious affiliation (OR = 1.3), or having parents who were either not married

or where one of the parents deceased (OR = 1.3) as independent predictors of 12-month treatment. Further, compared with students with heterosexual orientation (without any same-sex attraction), those with heterosexual orientation (with some same-sex attraction; OR = 1.4) and those with nonheterosexual orientation (without same-sex intercourse; OR = 1.7) were more likely to seek help. In addition, lower parental education was associated to lower odds

TABLE 3 Socio-demographic correlates of lifetime treatment^a

Correlates	Prevalence ^b	Bivariate ^b aOR [95% CI]	Multivariate ^c aOR [95% CI]
Belgium	12.5 (0.4)	(Ref)	(Ref)
Australia	12.5 (0.7)	1.1 [0.8, 1.6]	0.9 [0.7, 1.4]
Germany	12.5 (0.6)	0.7 [0.5, 0.9]*	0.6 [0.4, 0.9]*
Mexico	12.5 (0.4)	1.2 [0.9, 1.4]	1.1 [0.9, 1.4]
Northern Ireland	12.5 (0.6)	1.3 [0.9, 1.8]	1.3 [0.9, 1.8]
South Africa	12.5 (0.6)	1.2 [0.9, 1.6]	1.0 [0.7, 1.4]
Spain	12.5 (0.6)	0.5 [0.3, 0.6]*	0.5 [0.4, 0.7]*
United States	12.5 (0.7)	1.4 [1.1, 1.9]*	1.2 [0.8, 1.7]
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		9.78 (7,36970)[<0.01]*	6.39 (7,4861)[<0.01]*
Being female	58.4 (0.9)	1.3 [1.1, 1.6]*	1.4 [1.2, 1.7]*
Age 20+	24.8 (0.8)	1.6 [1.4, 2.0]*	1.8 [1.5, 2.3]*
Age 19	25.5 (0.8)	1.1 [0.9, 1.3]	1.1 [0.9, 1.4]
Age 18	49.7 (0.9)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		12.52 (2,636)[<0.01]*	14.89 (2,646)[<0.01]*
Parental education low	18.8 (0.8)	0.6 [0.5, 0.7]*	0.6 [0.5, 0.7]*
Parental education medium	24.0 (0.8)	0.8 [0.6, 1.0]*	0.9 [0.7, 1.0]
Parental education high	57.2 (1.0)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		12.29 (2,505)[<0.01]*	11.95 (2,583)[<0.01]*
Parents not married or parent(s) deceased	29.9 (0.9)	1.7 [1.5, 2.0]*	1.6 [1.4, 2.0]*
Place raised rural area	7.2 (0.5)	1.0 [0.7, 1.4]	1.0 [0.7, 1.4]
Place raised suburbs	17.8 (0.8)	1.3 [1.0, 1.7]*	1.1 [0.8, 1.5]
Place raised town/village	21.2 (0.8)	0.8 [0.7, 1.0]	0.9 [0.7, 1.2]
Place raised large city	25.9 (0.9)	1.1 [0.9, 1.3]	1.0 [0.8, 1.3]
Place raised small city	27.9 (0.9)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		3.11 (4,389)[0.02]*	0.44 (4,344)[0.78]
Another religion	7.4 (0.6)	1.1 [0.8, 1.6]	1.0 [0.7, 1.4]
No religion	35.3 (1.0)	0.9 [0.8, 1.1]	1.1 [0.9, 1.3]
Christian	57.3 (1.0)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		0.73 (2,442)[0.48]	0.33 (2,1330)[0.72]
Nonheterosexual with same-sex sexual intercourse	8.6 (0.6)	1.2 [0.9, 1.7]	1.2 [0.8, 1.7]
Nonheterosexual without same-sex sexual intercourse	11.7 (0.7)	1.4 [1.1, 1.9]*	1.4 [1.0, 1.9]*
Heterosexual—some same-sex attraction	17.4 (0.7)	1.2 [1.0, 1.5]*	1.2 [1.0, 1.4]
Heterosexual—no same-sex attraction	62.3 (1.0)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		2.34 (3,92)[0.08]	1.65 (3,110)[0.18]
Other	1.8 (0.3)	0.7 [0.4, 1.3]	0.7 [0.4, 1.4]
Private hall of residence	3.3 (0.4)	1.0 [0.6, 1.7]	0.9 [0.5, 1.5]
Shared house or apartment/flat	11.0 (0.6)	0.9 [0.7, 1.1]	0.9 [0.7, 1.2]
University or college hall of residence	28.9 (1.0)	1.3 [1.1, 1.6]*	1.1 [0.8, 1.5]
Parents or other relative or own home	55.0 (1.1)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		2.97 (4,217)[0.02]*	0.70 (4,295)[0.59]
Expected to work on a student job	71.4 (0.9)	1.4 [1.2, 1.7]*	1.2 [1.0, 1.5]
Self-reported ranking high school bottom 70%	25.0 (0.8)	0.9 [0.7, 1.1]	0.8 [0.7, 1.1]
Self-reported ranking high school top 30 to 10%	30.0 (0.9)	1.0 [0.8, 1.3]	0.9 [0.7, 1.2]
Self-reported ranking high school top 10 to 5%	21.5 (0.8)	1.0 [0.8, 1.3]	1.0 [0.8, 1.3]
Self-reported ranking high school top 5%	23.6 (0.8)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		0.94 (3,305)[0.42]	1.38 (3,539)[0.25]
Most important reason to go to college extrinsic	11.2 (0.7)	1.2 [0.9, 1.6]	1.2 [0.9, 1.6]

Note. Analyses are restricted to the subsample of respondents with any lifetime mental disorder or any lifetime suicidal thoughts or behaviors (47.5% of the full sample). aOR: adjusted odds ratio; cat.: categorical; CI: confidence interval; con.: continuous; SE: standard error.

^aRespondents with age of last treatment lower than the minimum age of onset across the six mental disorders and suicidal outcomes under study are coded as not having received treatment.

^bBivariate models adjust for the predicted probabilities calculated using the coefficients of the clinical predictors in the final model shown in Table 2 (last column).

^cMultivariate models adjust for the predicted probabilities calculated using the coefficients of the clinical predictors in the final model shown in Table 2 (last column) and for the predictors shown in the rows.

^d*F*-test to evaluate joint significance of categorical predictor levels. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

TABLE 4 Twelve-month mental disorders and 12-month suicidal thoughts and behaviors (STB) as predictors for 12-month treatment^a

Correlates	Prevalence ^b % (SE)	12-Month treatment				
		Bivariate ^c aOR [95% CI]	Multivariate 1 ^d aOR [95% CI]	Multivariate 2 ^d aOR [95% CI]	Multivariate 3 ^d aOR [95% CI]	Multivariate 4 ^d aOR [95% CI]
Type of 12-month mental disorder						
Major depressive episode	18.5 (0.5)	5.2 [4.4, 6.2]*	3.0 [2.4, 3.6]*	3.7 [2.9, 4.9]*	3.4 [2.6, 4.5]*	2.7 [2.1, 3.6]*
Generalized anxiety disorder	16.7 (0.5)	5.4 [4.5, 6.4]*	2.9 [2.3, 3.5]*	3.8 [2.9, 4.9]*	3.4 [2.6, 4.4]*	3.2 [2.4, 4.2]*
Panic disorder	4.5 (0.3)	5.1 [3.6, 7.1]*	2.5 [1.7, 3.7]*	3.3 [2.0, 5.2]*	3.4 [2.1, 5.4]*	3.3 [2.1, 5.4]*
Broad mania	3.1 (0.2)	2.6 [1.9, 3.6]*	0.8 [0.6, 1.3]	1.2 [0.7, 1.9]	1.2 [0.7, 1.9]	1.0 [0.6, 1.7]
Alcohol abuse or dependence	6.3 (0.3)	1.7 [1.3, 2.3]*	1.2 [0.9, 1.7]	1.5 [1.1, 2.1]*	1.5 [1.1, 2.1]*	1.4 [1.0, 2.0]
Drug abuse or dependence	3.0 (0.2)	3.6 [2.5, 5.2]*	2.6 [1.7, 4.0]*	3.4 [2.2, 5.4]*	3.2 [2.1, 5.1]*	3.1 [1.9, 4.8]*
<i>F</i> (ndf,ddf)[<i>p</i> value] ^e			77.82 (6,238) [<0.01]*	28.05 (6,318) [<0.01]*	23.59 (6,334) [<0.01]*	18.99 (6,262) [<0.01]*
Number of 12-month mental disorders (con.)		2.3 [2.1, 2.5]*		0.8 [0.6, 0.9]*		
Number of 12-month disorders (cat.)						
None	68.6 (0.6)					
Exactly one mental disorder	17.2 (0.5)	3.2 [2.6, 4.0]*				
Exactly two mental disorders	9.4 (0.4)	8.0 [6.4, 10.1]*			0.8 [0.5, 1.2]	0.8 [0.5, 1.2]
Three or more mental disorders	4.8 (0.3)	12.1 [8.8, 16.5]*			0.4 [0.2, 0.8]*	0.4 [0.2, 0.9]*
<i>F</i> (ndf,ddf)[<i>p</i> value] ^f		132.46 (3,168) [<0.01]*			3.47 (2,287) [0.03]*	2.99 (2,272) [0.05]
12-Month STB						
Never	82.8 (0.5)					
Ideation only	8.4 (0.4)	2.6 [2.1, 3.3]*				1.6 [1.3, 2.1]*
Plan, no attempts	7.8 (0.4)	5.3 [4.2, 6.6]*				2.5 [1.9, 3.3]*
Planned or unplanned attempts	1.0 (0.1)	8.2 [4.4, 15.4]*				3.0 [1.3, 6.6]*
<i>F</i> (ndf,ddf)[<i>p</i> value] ^f		74.73 (3,224) [<0.01]*				16.43 (3,273) [<0.01]*
Model fit						
Akaike information criterion			6,832.2	6,822.8	6,821.1	6,743.5
Area under the curve			0.787	0.788	0.788	0.796

Note. aOR: adjusted odds ratio; cat.: categorical; CI: confidence interval; con.: continuous; SE: standard error.

^aRespondents with age of last treatment lower than the minimum age of onset across the six mental disorders and suicidal outcomes under study are coded as not having received treatment.

^bTo obtain pooled estimates of prevalence, each country was given an equal sum of weights.

^cBivariate models adjust for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, and most important reason to go to university), and country membership.

^dMultivariate models adjust for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, and most important reason to go to university), country membership, and for predictors shown in the rows.

^e*F*-test to evaluate joint significance of six types of mental disorders. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

^f*F*-test to evaluate joint significance of categorical predictor levels. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

of seeking treatment (ORs 0.6–0.7). We also found two college-related variables that were independently associated with the odds of 12-month treatment. First, compared with those still living with their family, students living in a college hall were more likely to be in treatment (OR = 1.4). Second, students with lower ranking in high school had markedly lower odds of seeking treatment (OR = 0.7), compared with those in the highest ranking. None of the two-way interactions between the predicted probabilities and socio-demographic correlates reached statistical significance (results available on request); *F*-test evaluating the model including two-way interactions versus the reduced model without interactions *F* (ndf,ddf)[*p* value] = 0.25 (31,55) [1.00]).

4 | DISCUSSION

This cross-national survey of college students in 19 colleges revealed that most students with either mental disorders and/or STB do not receive mental health treatment. In general, unmet need for mental disorders and STB among emerging adults in college is concerning. Unmet need was lower among those with mood or anxiety disorders as well as with more severe STB.

Our results should be interpreted in light of the limitations noted in previous papers on this issue. First, the response rates were not optimal in all countries. Although it has been shown that the association between response rate and nonresponse bias is not necessarily

TABLE 5 Socio-demographic correlates of 12-month treatment^a

Correlates	Prevalence ^b	Bivariate ^b aOR [95% CI]	Multivariate ^c aOR [95% CI]
Belgium	12.5 (0.4)	(Ref)	(Ref)
Australia	12.5 (0.8)	1.5 [0.9, 2.6]	1.4 [0.8, 2.3]
Germany	12.5 (0.7)	0.7 [0.5, 1.1]	0.7 [0.5, 1.2]
Mexico	12.5 (0.4)	0.7 [0.5, 0.9]*	0.8 [0.6, 1.1]
Northern Ireland	12.5 (0.7)	1.1 [0.7, 1.7]	1.2 [0.8, 2.0]
South Africa	12.5 (0.7)	1.5 [1.0, 2.3]*	1.3 [0.9, 2.1]
Spain	12.5 (0.7)	0.6 [0.4, 0.9]*	0.7 [0.4, 1.0]
United States	12.5 (0.8)	2.1 [1.4, 3.2]*	1.3 [0.8, 2.0]
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		6.25 (7,86)[<0.01]*	1.96 (7,136)[0.06]
Being female	59.8 (1.0)	1.7 [1.2, 2.3]*	1.6 [1.2, 2.2]*
Age 20+	23.9 (0.9)	1.2 [0.9, 1.6]	1.5 [1.1, 2.0]*
Age 19	25.8 (0.9)	0.9 [0.7, 1.1]	1.0 [0.8, 1.3]
Age 18 ^b	50.3 (1.0)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		2.18 (2,413)[0.11]	4.44 (2,443)[0.01]*
Parental education low	18.4 (0.9)	0.6 [0.4, 0.8]*	0.6 [0.4, 0.9]*
Parental education medium	24.7 (1.0)	0.6 [0.5, 0.8]*	0.7 [0.6, 0.9]*
Parental education high	56.9 (1.1)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		9.55 (2,171)[<0.01]*	5.54 (2,236)[<0.01]*
Parents not married or parent(s) deceased	30.7 (1.0)	1.4 [1.1, 1.7]*	1.3 [1.0, 1.6]*
Place raised rural area	7.8 (0.6)	1.0 [0.7, 1.5]	0.9 [0.6, 1.4]
Place raised suburbs	17.9 (0.9)	2.1 [1.6, 2.8]*	1.2 [0.8, 1.6]
Place raised town/village	20.4 (0.9)	0.9 [0.7, 1.3]	0.8 [0.6, 1.2]
Place raised large city	26.3 (1.0)	1.1 [0.8, 1.4]	0.9 [0.7, 1.3]
Place raised small city	27.6 (1.0)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		7.15 (4,175)[<0.01]*	0.76 (4,256)[0.55]
Another religion	7.7 (0.7)	1.5 [1.0, 2.2]	1.0 [0.7, 1.5]
No religion	35.1 (1.1)	1.4 [1.1, 1.7]*	1.3 [1.0, 1.6]*
Christian	57.2 (1.1)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		4.30 (2,125)[0.02]*	2.03 (2,156)[0.13]
Nonheterosexual with same-sex sexual intercourse	8.9 (0.6)	1.4 [0.9, 2.2]	1.2 [0.8, 1.9]
Nonheterosexual without same-sex sexual intercourse	12.5 (0.9)	2.2 [1.5, 3.2]*	1.7 [1.2, 2.6]*
Heterosexual—some same-sex attraction	18.0 (0.8)	1.7 [1.3, 2.3]*	1.4 [1.1, 1.9]*
Heterosexual—no same-sex attraction	60.7 (1.2)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		5.61 (3,42)[<0.01]*	3.13 (3,72)[0.03]*
Other	1.5 (0.3)	0.8 [0.3, 1.9]	0.8 [0.3, 1.9]
Private hall of residence	3.4 (0.4)	0.8 [0.4, 1.6]	0.8 [0.4, 1.5]
Shared house or apartment/flat	11.3 (0.7)	0.8 [0.6, 1.1]	0.9 [0.6, 1.2]
University or college hall of residence	29.4 (1.1)	2.1 [1.6, 2.7]*	1.4 [1.0, 2.0]*
Parents or other relative or own home	54.3 (1.2)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		9.82 (4,81)[<0.01]*	1.98 (4,110)[0.10]
Expected to work on a student job	71.6 (1.0)	1.2 [0.9, 1.5]	1.2 [0.9, 1.5]
Self-reported ranking high school bottom 70%	25.4 (0.9)	0.7 [0.5, 0.9]*	0.7 [0.5, 1.0]*
Self-reported ranking high school top 30 to 10%	30.8 (1.0)	0.8 [0.6, 1.0]	0.7 [0.6, 1.0]*
Self-reported ranking high school top 10 to 5%	21.6 (0.9)	0.8 [0.6, 1.1]	0.8 [0.6, 1.1]
Self-reported ranking high school top 5%	22.2 (0.8)	(Ref)	(Ref)
<i>F</i> (ndf,ddf)[<i>p</i> value] ^d		2.63 (3,189)[0.05]	2.13 (3,246)[0.10]
Most important reason to go to college extrinsic	11.0 (0.8)	0.8 [0.6, 1.2]	0.9 [0.6, 1.4]

Note. Analyses are restricted to the subsample of respondents with any 12-month mental disorder or any 12-month suicidal thoughts or behaviors (36.9% of the full sample). aOR: adjusted odds ratio; cat.: categorical; CI: confidence interval; con.: continuous; SE: standard error.

^aRespondents with age of last treatment lower than the minimum age of onset across the six mental disorders and suicidal outcomes under study are coded as not having received treatment.

^bBivariate models adjust for the predicted probabilities calculated using the coefficients of the clinical predictors in the final model shown in Table 4 (last column).

^cMultivariate models adjust for the predicted probabilities calculated using the coefficients of the clinical predictors in the final model shown in Table 4 (last column) and for the predictors shown in the rows.

^d*F*-test to evaluate joint significance of categorical predictor levels. ddf: denominator degrees of freedom; Ndf: numerator degrees of freedom.

strong (Groves, 2006), recent additions warn of potential overestimation of mental disorders and STB when response rates are low (Mortier et al., 2017). The difference in response rates across countries may be partially explained by the different methodologies used across universities to recruit students. It is important to stress, however, that all students were eligible for participation. Second, college students who did not speak the dominant language(s) of the university sufficiently were not included in this study. Third, the treatment modules used in the WMH-ICS ask for treatment for emotional or substance abuse problems and not for STB per se. Although we did control for country differences, STB may not always be considered as an emotional or psychological problem and, hence, not be a behavior for which to seek help (despite being clinically warranted). Moreover, the information we gathered on treatment access did not include information about the adequacy or effectiveness of the treatment received nor the extent to which treatment availabilities were either affordable or accessible.

Fourth, our data are based on the results of a screening instrument that assesses a limited range of mental disorders and STB. This means that some burdensome conditions (such as psychosis) or other relevant conditions associated with mental health (such as tobacco use) were not included in the WMH-ICS core assessment. In addition, the screening instrument precludes detailed assessments on important socio-demographic predictors (e.g., detailed family situation at time of survey). Fifth, this study is limited to the use of cross-sectional data, adjusting for a limited range of basic socio-demographic and college-related correlates. Future studies may include additional predictor domains to investigate patterns of service use throughout the academic career and investigate all possible two-way interactions between predictors. Sixth, the implementation of MI to address missing data comes at the cost of a reduced number of variable levels that can be included in both imputation and analysis models. For instance, this precluded a more fine-grained analysis of STB outcomes (e.g., passive vs. active suicidal ideation) or predictors of service use STB correlates (e.g., parental marital status vs. parental loss). Future studies on larger samples should address this issue.

Notwithstanding these limitations, our study confirms the high level of unmet need for mental disorders and STB in college populations, across countries included in this WMH-ICS Initiative. On balance, this unmet need is roughly the same for mental disorders as for STB, with only 25–30% of first year college students with a mental disorder/STB receiving any treatment in a given year. Our data confirm previous reports on the use of services among college students, although our estimates on treatment utilization are somewhat on the lower end of what is generally found in the United States (Han et al., 2016; Hunt & Eisenberg, 2010), Europe (McLafferty et al., 2017; Verger et al., 2010), and Asia (Liu et al., 2017). Despite the observed unmet need, the presence of mental disorders/STB remains a strong predictor of treatment. Rates vary significantly across types of disorders, but specifically, anxiety disorders (i.e., panic disorder and GAD) yield the highest treatment rates in our study, as previously found in a U.S. study (Eisenberg et al., 2011). This is interesting because in *nonstudents* (both in general populations and aged-matched peers), it appears that depression is

more likely associated with higher treatment odds than anxiety disorders (Bergeron, Poirier, Fournier, Roberge, & Barrette, 2005). That anxiety disorders yield higher treatment receipt in college than depression is to some extent counterintuitive. After all, depression remains one of the most burdensome disorders in college, as confirmed with international data (Alonso et al., 2018; Rotenstein et al., 2016). Our data contradict the conventional ideas that mood disorders are generally the impetus for receiving mental health care in college, as found in a recent U.S. study (Pedrelli, Borsari, Lipson, Heinze, & Eisenberg, 2016) and that depression is worldwide among the most highly treated mental disorders with the lowest delays in help seeking (Wang et al., 2007; Wang, Berglund, Olfson, & Kessler, 2004).

Low treatment rates for alcohol use disorders are not surprising but are somewhat higher than mostly reported previously in U.S. students (Lee, Martins, & Lee, 2015; Wu, Pilowsky, Schlenger, & Hasin, 2007) and general populations worldwide (Wang et al., 2007). Specifically for a college population, low treatment of alcohol problems may be related to the fact that most alcohol use disorders have their general onset *in* and not *prior to* college (Auerbach et al., 2016), probably related to the culture of alcohol on campuses. In addition, we also know that only a low proportion of adults make treatment contact in the same year of the disorder onset (Wang et al., 2004). This is because people with alcohol use disorders are oftentimes lacking a need for treatment until their disorders become highly debilitating (Kaskutas, Weisner, & Caetano, 1997). In addition, among those who were receiving services, the specificity of treatment was generally low, as found in the 2014 National Survey on Drug Use and Health from the United States, showing that only 8% in the 18–25 age group received specialized treatment for substance use problems (Substance Abuse and Mental Health Services Administration, 2015). In contrast to what we found for alcohol use disorders, around one third of the first year students with drug use disorders (estimated at 3% of the sample) received treatment in the past year, with four in 10 receiving treatment in their lifetime. This is a far higher estimate than commonly believed based on U.S. findings (Blanco et al., 2008). One explanation may be that, because of the high comorbidity between mental disorders and substance use disorders, students may have been seeking treatment for their emotional problems and not for their substance abuse problems per se. As far as we know, our study is the first one that assessed treatment rates of first year students with drug use disorders separately and independent from the presence of alcohol use disorders. The National Epidemiologic Survey on Alcohol and Related Conditions provides some comparison of treatment rates for drug use disorders (although on a general population level), reporting lifetime treatment rates of 31% for their general population sample (Melchior, Prokofyeva, Younès, Surkan, & Martins, 2014).

Our data do not show a clear and direct gradient between mental disorder severity and treatment odds. In descriptive and bivariate analyses, we did find such an association but multivariate models failed to retain statistical significance. We even found subadditive effects in students with multiple mental disorders. This suggests that the presence of comorbid mental disorders is not equal to a higher perceived need for treatment, especially not among college students.

Or it may be that students do have a level of perceived need but are actually impeded by stigma. In contrast, we did find a clear and direct gradient between STB severity and treatment, in both bivariate and multivariate approaches. But even in the case that higher suicidality is associated with higher treatment odds, a far more important finding is the vast unmet need for STB among suicidal college populations that appears to be even larger than unmet need for STB in the general population. The proportion of suicidal persons from general populations worldwide that received treatment in a given year was estimated at approximately 39% (Bruffaerts et al., 2011) compared with approximately 20% in the present study. This may be an artifact because of the difference in populations or the fact that our study only included first year students. Indeed, it may be that we would find higher treatment rates for STB in the postgraduate years, consistent with the finding that structural barriers to seeking help for STB decrease with age (Bruffaerts et al., 2011). This should be further investigated in longitudinal designs.

If we look at nonclinical correlates of treatment, we confirm existing knowledge from the United States on treatment rates being higher in female students and those older than 18 years and lower in students with lower educated parents (Blanco et al., 2008). Further, two out of three sexual minority groups have systematically higher odds of being treated, independent of whether they have mental disorders or STB. This finding has been mostly explained by increased levels of psychological distress among sexual minorities (Dunbar, Sontag-Padilla, Ramchand, Seelam, & Stein, 2017). It may also be that barriers and reasons in favor of seeking treatment function differently in sexual minorities. The fact that nonheterosexual and heterosexual students with same-sex attraction make up a significant proportion of college students (i.e., around four in 10 first year students), more investigation is needed regarding help-seeking processes and receipt of treatment, especially against the background of an overall lack of knowledge and scientific research on sexual minority groups in college.

In an era where great emphasis lies on the prevention of mental disorders and STB among young people worldwide, this first cross-national, college-based study of treatment for mental disorders and STB holds some important implications. Clinicians, policy-makers, university officials, and students should be aware of the significance of the high degree of unmet need among first year college students across the world. The personal and psychological significance of the transition between high school and college consists of a shift in responsibilities, a change of social environments (Evans, Forney, Guido, Patton, & Renn, 2009), markedly higher levels of emotional distress (Towbes & Cohen, 1996), and increased odds of mental disorders and STB. To decrease the large proportions of untreated students with mental disorders/STB—and thus to prevent a further progression of mental illness in college—specific actions may be needed to expand or reallocate treatment resources to increase treatment access. To this end, innovative low-cost and low-threshold interventions (such as guided or unguided internet- and mobile-based interventions) could be approaches to reduce college-related stress and might potentially attract students with emotional problems who would not otherwise seek help (Harrer et al., 2018).

ACKNOWLEDGMENTS

Funding to support this initiative was received from the National Institute of Mental Health (NIMH) R56MH109566 (R. P. A.), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or NIMH; the Belgian Fund for Scientific Research (11N0514N/11N0516N/1114717 N) (P. M.), the King Baudouin Foundation (2014-J2140150-102905) (R. B.), and Eli Lilly (IIT-H6U-BX-1002) (R. B. and P. M.); BARMER, a health care insurance company, for project StudiCare (D. D. E.); ZonMw (Netherlands Organisation for Health Research and Development; grant 636110005) and the PFGV (PFGV; Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (P. C.); South African Medical Research Council and the Ithimba Foundation (D. J. S.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440), Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya (2017 SGR 452), FPU (FPU15/05728) (J. A.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER (PI13/00506) (G. V.); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (T. B.); Consejo Nacional de Ciencia y Tecnología (CONACyT) grant CB-2016-01-285548 (CB). The World Mental Health International College Student (WMH-ICS) initiative is carried out as part of the WHO World Mental Health (WMH) Survey Initiative. The WMH survey is supported by the National Institute of Mental Health NIMH R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (R. C. K.). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

DECLARATION OF INTEREST STATEMENT

In the past 3 years, Dr Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. Dr Ebert has received consultant fees and served on the scientific advisory board for several companies, including MindDistrict, Lantern, Schoen Kliniken, and German health insurance companies (BARMER, Techniker Krankenkasse). He also is a stakeholder in the institute for health training online (GET.ON),

which aims to implement scientific findings related to digital health interventions into routine care.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Bruffaerts R, Mortier P, Auerbach RP, et al. Lifetime and 12-month treatment for mental disorders and suicidal thoughts and behaviors among first year college students. *Int J Methods Psychiatr Res*. 2019;28:e1764. <https://doi.org/10.1002/mpr.1764>

SPECIAL ISSUE

Barriers of mental health treatment utilization among first-year college students: First cross-national results from the WHO World Mental Health International College Student Initiative

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Funding information

Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER, Grant/Award Numbers: P113/00343 and P113/00506; Instituto de Salud Carlos III, Grant/Award Numbers: CD12/00440 and CM14/00125; Northern

Abstract

Background: Although mental disorders and suicidal thoughts-behaviors (suicidal thoughts and behaviors) are common among university students, the majority of students with these problems remain untreated. It is unclear what the barriers are to these students seeking treatment.

Aims: The aim of this study is to examine the barriers to future help-seeking and the associations of clinical characteristics with these barriers in a cross-national sample of first-year college students.

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Ireland Public Health Agency; Bristol-Myers Squibb; GlaxoSmithKline; Ortho-McNeil Pharmaceutical; Pan American Health Organization; Fogarty International Center, Grant/Award Number: FIRCA R03-TW006481; US Public Health Service, Grant/Award Numbers: R01 DA016558, R01-MH069864 and R13-MH066849; Pfizer Foundation; John D. and Catherine T. MacArthur Foundation; Consejo Nacional de Ciencia y Tecnología (CONACYT), Grant/Award Number: CB-2016-01-285548; Ulster University; Northern Ireland Public Health Agency (HSC R&D); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland; FPU, Grant/Award Number: FPU15/05728; DIUE Generalitat de Catalunya, Grant/Award Number: 2017 SGR 452; Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD, Grant/Award Number: 2015I015; ISCIII, Grant/Award Numbers: CD12/00440 and CM14/00125; Ithemba Foundation; South African Medical Research Council; Protestants Fonds voor de Geestelijke Volksgezondheid; ZonMw, Grant/Award Number: 636110005; BARMER; Eli Lilly and Company, Grant/Award Number: IIT-H6U-BX-I002; King Baudouin Foundation United States, Grant/Award Number: 2014-J2140150-102905; Belgian Fund for Scientific Research, Grant/Award Numbers: 1114717N, 11N0514N and 11N0516N; National Institute of Mental Health (NIMH), Grant/Award Numbers: R56MH109566 and R01MH070884

Method: As part of the World Mental Health International College Student (WMH-ICS) initiative, web-based self-report surveys were obtained from 13,984 first-year students in eight countries across the world. Clinical characteristics examined included screens for common mental disorders and reports about suicidal thoughts and behaviors. Multivariate regression models adjusted for socio-demographic, college-, and treatment-related variables were used to examine correlates of help-seeking intention and barriers to seeking treatment.

Results: Only 24.6% of students reported that they would definitely seek treatment if they had a future emotional problem. The most commonly reported reasons not to seek treatment among students who failed to report that they would definitely seek help were the preference to handle the problem alone (56.4%) and wanting to talk with friends or relatives instead (48.0%). Preference to handle the problem alone and feeling too embarrassed were also associated with significantly reduced odds of having at least some intention to seek help among students who failed to report that they would definitely seek help. Having 12-month major depression, alcohol use disorder, and suicidal thoughts and behaviors were also associated with significantly reduced reported odds of the latter outcome.

Conclusions: The majority of first-year college students in the WMH-ICS surveys report that they would be hesitant to seek help in case of future emotional problems. Attitudinal barriers and not structural barriers were found to be the most important reported reasons for this hesitation. Experimental research is needed to determine whether intention to seek help and, more importantly, actual help-seeking behavior could be increased with the extent to which intervention strategies need to be tailored to particular student characteristics. Given that the preference to handle problems alone and stigma appear to be critical, there could be value in determining if internet-based psychological treatments, which can be accessed privately and are often built as self-help approaches, would be more acceptable than other types of treatments to student who report hesitation about seeking treatment.

KEYWORDS

epidemiology, public mental health, service utilization, student, treatment gap

1 | INTRODUCTION

Mental disorders and suicidal thoughts and behaviors are highly prevalent among college students (Auerbach et al., 2016, 2018; Mortier et al., 2018) and are associated with substantial current role impairments (Alonso et al., 2018) as well as with diverse negative long-term consequences such as lower academic achievement (Bruffaerts et al., 2018; Eisenberg, Golberstein, & Hunt, 2009; Hysenbegasi, Hass, & Rowland, 2005; Mortier et al., 2015), higher risk for dropout (Ishii et al., 2018; Kessler, Foster, Saunders, & Stang, 1995), and worse functioning in later life (Goldman-Mellor et al., 2014; Niederkrotenthaler et al., 2014).

Despite the wide availability and efficacy of clinical interventions (Cuijpers et al., 2013), the vast majority of college students with clinically significant mental disorders and suicidal thoughts and behaviors

remain untreated even in high income countries (Auerbach et al., 2016; Blanco et al., 2008; Demyttenaere et al., 2004; Eisenberg et al., 2009; Larisch et al., 2013; Mortier et al., 2018). Cross-national data suggest that less than one in four students with any 12-month mental disorder or suicidal thoughts and behaviors (STB) receives any kind of treatment (Bruffaerts et al., 2019), with 12-month disorder-specific treatment rates ranging from 19.8% for alcohol use disorder to 42% for panic disorder.

Structural supply shortfalls doubtlessly are at least partially responsible for these low treatment rates. However, recent studies suggest that a large number of affected students do not make use of treatments even when they are available (Bruffaerts et al., 2019). Known barriers to treatment include the perception that treatment is not needed, lack of time, perceived stigma, and preference for self-management (Eisenberg, Hunt, & Speer, 2012; Vidourek, King, Nabors, & Merianos,

2014). These findings are in line with results from a systematic review of reported barriers to mental health treatment in adolescent general population samples that identified stigma, embarrassment, problems recognizing symptoms, and a preference for self-reliance as the most important barriers (Gulliver, Griffiths, & Christensen, 2010).

To the best of our knowledge, no cross-national data exist on barriers to mental health help-seeking among college students, as most published studies on that topic have been based on cohorts in the United States (Csyz et al., 2013; Eisenberg et al., 2012; Vidourek et al., 2014, Eisenberg et al., 2014). The aim of the current study is to present preliminary information about these barriers based on data collected in the World Mental Health International College Student (WMH-ICS) surveys. We focus on reported willingness of first-year college students from eight countries worldwide to use mental health services, reported barriers to such help-seeking and the correlates of reported these barriers.

2 | METHODS

2.1 | Sample and procedures

As reported in prior papers in this issue, the first phase of survey data collection in the WMH-ICS designed to obtain basic cross-national information on the prevalence, incidence, and correlates of mental, substance, and behavioral disorders among college students worldwide; to describe patterns of service use, barriers to treatment, and unmet need for treatment; to investigate the associations of these disorders with role function in academic and other life domains; to evaluate the effects of a wide range of preventive and clinical interventions on student mental health, functioning, and academic performance; and to develop precision medicine clinical decision support tools to help select the right interventions for the right students (Cuijpers et al., 2019).

Web-based self-report questionnaires were administered to representative samples of first-year students in 19 colleges and universities (seven private, 12 public; henceforth referred to as “colleges”) in eight countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Each collaborating college obtained ethical approval to participate in the project and all participants provided informed consent. This initial round of WMH-ICS surveys was conducted between October 2014 and February 2017. The sample size ranged from 633 in Australia to 4,590 in Belgium, with a total of 14,371 students across countries and a weighted mean response rate across all surveys of 45.5%. For the present analysis, we restricted the sample to full-time students that self-identified as male or female ($n = 13,984$) and excluded those with missing information on gender or full-time status ($n = 35$) or who did not identify as male or female ($n = 50$) or who reported part-time status ($n = 302$).

Most of these students came from the Australian sample and were older, full-time employed people who would normally be expected to access mental health services, if they were needed, through their

employer or employer sponsored health insurance rather than through their college. In addition, preliminary analyses reported below showed that the majority of the 50 remaining students who identified either as transgender or “other” rather than as male or female endorsed a number of mental disorders and experienced considerable impairment, leading us to focus on them in a separate report.

All first-year students in the colleges were invited to participate in a web-based self-report health survey. While the core set of survey questions was identical across all countries, the initial mode of contact varied across colleges. In all cases other than in Mexico, we attempted to recruit 100% of first-year students either as part of a health evaluation, the registration process, or in a stand-alone web survey delivered to students via their university email addresses. Students in Mexico were invited to fill out the survey in conjunction with mandatory activities (e.g., student health evaluations and tutoring sessions). Other than in Mexico, where no attempts were made to recruit initial nonrespondents, attempts to complete the survey with initial nonrespondents were made through a series of personalized reminder emails. Financial incentives were used in the final stages of recruitment in 10 of these colleges. Spain applied an “end-game” strategy, in which a random sample of nonrespondents received a financial incentive for one last chance at participation, with those responding in this final phase given a weight equal to the inverse of their probability of selection to adjust for the undersampling of these hard-to-recruit students.

2.2 | Measures

2.2.1 | Intention to use mental health services

Intention to use mental health services in case of a future emotional problem was assessed by asking participants “If during this coming school year, you developed an emotional problem that caused you a lot of distress and interfered with your school work, how likely would you be to go to the student Counseling Center for help?” “How likely would you be to go somewhere else for help, like to your doctor, a mental health professional, or religious advisor?” (definitely would go [4]; probably would go [3]; might or might not go [2]; probably would not go [1]; definitely would not go [0]; Ursano, 2012). A dichotomy was created by collapsing the highest two values in response to either of these two questions into a positive value and others into a negative value.

2.2.2 | Barriers of treatment

If participants did not indicate that they “definitely would go” to seek help in case of a future emotional problem, they were asked about potential reasons: “If you decided not to seek help if you developed such a problem, how important do you think each of these would be as reasons for not seeking help?”. Reasons listed were: “You are not sure available treatments are very effective”; “You would want to handle the problem on your own”; “You would be too embarrassed”; “You would talk to friends or relatives instead”; “You think it costs

too much money”; “You are unsure of where to go or who to see”; “You anticipate problems with time, transportation, or scheduling”; “You are afraid it might harm your school or professional career”; “You are afraid of different treatment from others”; and “Other reasons” (1 = very important; 2 = important; 3 = moderately important; 4 = somewhat important; 5 = unimportant; Hoge et al., 2004; Kessler et al., 2008).

2.2.3 | Mental disorders

As described in more detail elsewhere in this issue (Auerbach et al., 2018) 12-month major depression, generalized anxiety disorder, panic disorder, broad mania, and drug use disorder were assessed using the validated self-report screening scales of the widely used Composite International Diagnostic Interview (Kessler, Calabrese, et al., 2013; Kessler & Üstün, 2004). These scales correlate highly with blinded clinical diagnoses based on the Structured Clinical Interview for DMS-IV (First, Spitzer, Gibbon, & Williams, 1994), with area under the curve (AUC) in the range 0.70–0.78 (Kessler, Calabrese, et al., 2013; Kessler, Santiago, et al., 2013). Alcohol use disorder was assessed using the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, De la Fuente, & Grant, 1993), with either a total score of 8+ or a score of 4+ on the AUDIT dependence questions as a definition for alcohol use disorder (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). The concordance of the AUDIT with clinical diagnoses is in the range AUC = 0.78–0.91 (Reinert & Allen, 2002).

2.2.4 | Suicidal thoughts and behaviors

Lifetime and 12 months suicidal thoughts and behaviors were assessed using a modified version of the Columbia Suicidal Severity Rating Scale (Posner et al., 2011). The key questions were: “Did you ever wish you were dead or would go to sleep and never wake up?” and “Did you ever in your life have thoughts of killing yourself?” (suicidal ideation); “Did you ever think about how you might kill yourself (e.g., taking pills, shooting yourself) or work out a plan of how to kill yourself?” (suicide plans); and “Have you ever made a suicide attempt (i.e., purposefully hurt yourself with at least some intent to die)?” (suicide attempts).

2.2.5 | Stages of change scale

All respondents were presented with an adapted version of the Stages of Change scale that asked

How would you rate your readiness or willingness to change any emotional or substance use problems you are experiencing at this time (check one of the following): I do not have a problem that I need to change; I have a problem, but I am not yet sure I want to take action to change it; I have a problem and I intend to address it; I have a problem and I already am working actively to change it; I had a problem but I have addressed it and things are better now.

2.2.6 | Socio-demographics

Gender was assessed by asking respondents whether they identified as being male, female, transgender (male-to-female/female-to-male), or “other.” Respondent age was categorized into three categories (18 years/19 years/20 or more years old). Parental educational level was assessed for father and mother separately and was categorized into high (university graduate or more), medium (some postsecondary education), and low (secondary school or less) based on the higher-of-both parents' educational levels. Parental marital status was dichotomized into “parents married and both alive” versus all others. Respondents were asked about the urbanicity of the place they were raised (small city/large city/town or village/suburbs/rural area) and their religious background (categorized into Christian/Other religion/No religion). Sexual orientation was classified into the categories heterosexual: gay or lesbian, bisexual, asexual, not sure, and other. Additional questions were asked about the extent to which respondents reported being attracted to men and women and the gender(s) of people they had sex with (if any) in the past 5 years. Responses were used to categorize each student as either heterosexual with no same-sex attraction, heterosexual with some same-sex attraction, nonheterosexual without same-sex sexual intercourse, and nonheterosexual with same-sex sexual intercourse.

2.2.7 | College-related predictors

Respondents were asked where they ranked academically compared with other students at the time of their high school graduation (from top 5% to bottom 10%; categorized into quartiles) and what their most important reason was for going to college. Based on the results of a tetrachoric factor analysis (details available on request), responses were categorized into either extrinsic reasons (i.e., “family wanted me to,” “my friends were going,” “teachers advised me to,” and “I did not want to get a job right away”) or intrinsic reasons (“to achieve a degree,” “I enjoy learning and studying,” “to study a subject that really interests me,” “to improve job prospects generally,” and “to train for specific type of job”). Respondents were also asked where they were living during the first semester of the academic year (parents', other relative's, or own home/university or college hall of residence/shared house, apartment, or flat/private hall of residence/other) and if they expect to work in a student job.

2.2.8 | Treatment utilization

Past year use of mental health treatment for any emotional or substance use problem was assessed by asking participants whether they ever got psychological counseling or medication for an emotional or substance problem along with ages of first and last times they received medication or counseling (Kessler & Üstün, 2004; Ursano, 2012; Hoge et al., 2004).

2.3 | Analysis

All analyses were conducted with SAS version 9.4. Data were weighted using poststratification weights (Groves & Couper, 2012) to adjust for differences between survey respondents and nonrespondents based on socio-demographic and college-related characteristics that were made available by institutional officials. Multiple imputation by chained equations (Van Buuren, 2012) was used to adjust for within-survey item nonresponse, random internal subsampling of survey sections, and missing data due to skip logic errors that occurred in some of the surveys. All analyses were conducted in the subsample that excluded the 24.6% of students who said they would definitely seek treatment in case of a future emotional problem ($n = 9,939$; 75.4% of the total sample). In the first step, we estimated the distribution of the eight reported barriers to seeking treatment in this subsample. To obtain pooled estimates of prevalence across countries, each country was given an equal sum of weights.

Second, we estimated the associations between both a total score for overall number of barriers for seeking treatment obtained by summing all eight barrier items (on the one hand) and type of 12-month mental disorder, number of 12-month mental disorders, and 12-month suicidal thoughts and behaviors (on the other hand). Ordinary least squares regression was used. We estimated bivariate associations adjusting only for country of survey followed by multivariate models including all possible combinations of predictor blocks, that is, (a) six types of 12-month mental disorders, coded as six dummy variables; (b) number of 12-month mental disorders, coded as a continuous predictor (ranging from zero to six); (c) number of 12-month mental disorders, coded as series of dummy variables indicating exactly one, exactly two, and three or more disorders; and (d) 12-month suicidal thoughts and behaviors. Best-fitting multivariate models were selected based on the Akaike information criterion. All multivariate models adjusted for socio-demographic and college-related predictors, country membership, past-year treatment, likelihood of seeking treatment in case of a future emotional problem, and scores on the stages of change scale. This enabled us to examine the associations of clinical characteristics with barriers over and above the socio-demographic, college-related, and treatment history-related variables associated with the clinical characteristics.

Third, we used ordinal regression to estimate the associations of the eight individual reported barriers for seeking treatment with type number of 12-month mental disorders and 12-month suicidal thoughts and behaviors. We began by estimated bivariate associations (adjusting for country membership only), followed by multivariate models including all possible combinations of predictor blocks. Multivariate models were adjusted for the same covariates as in Step 2, as well as for the total barriers score to identify unique associations between clinical characteristics and specific barriers, above and beyond the effect of the total barriers score.

Fourth, we again used ordinal regression to examine the associations of likelihood of seeking treatment in case of a future emotional problem with the eight barriers, type of 12-month mental disorder, number of 12-month mental disorders, and 12-month

suicidal thoughts and behaviors. As in early steps in the analysis, models included all possible combinations of predictor blocks and adjusted for the same covariates as in Step 2. Although only the best-fitting models are reported below, results of all other models are available on request. We exponentiated the regression coefficients and their multiple imputation-based standard errors to obtain odds ratios (ORs) and associated 95% confidence intervals. Statistical significance was set in all analyses at level $\alpha < .05$ using two-sided tests.

3 | RESULTS

3.1 | Sample description and willingness to seek help in the overall sample

Only 24.6% of the 13,984 students in the total sample indicated that they would definitely seek help in case of a future emotional problem, whereas 32% said they probably would seek help, 24.9% might or might not, 13.3% probably would not, and 5.2% definitely would not. Subsequent analyses focused on the 75.4% ($n = 9,939$) of students exclusive of those who reported that they definitely would seek help. More than one fourth (28.6%) of the students who would not definitely seek treatment fulfilled the criteria for at least one of the 12-month mental disorder assessed in the survey. The most prevalent 12-month disorders were major depressive episode (18.6%) and generalized anxiety disorder (16.1%), with 17.9% of the focal sample meeting criteria for exact one, 8.9% exact two, and 4.7% three or more of the mental disorders assessed in the survey. Twelve-month suicide ideation was reported by 8.8% of the respondents who would not definitely seek treatment, and 7.8% reported a 12-month suicide plan. Patterns of service use among these students as a function of 12-month disorders are reported elsewhere in this issue (Bruffaerts et al., 2019).

3.2 | Barriers to mental health treatment

Table 1 shows the distribution of barriers and their relative importance among students in the focal sample. The barrier rated the most important was the preference to handle the problem alone (rated either "important" or "very important" by 56.4% of respondents) followed by wanting to talk with friends or relatives instead (48%) and being too embarrassed to seek help (32.2%). Structural barriers such as cost (24.1%) and anticipating problems with time, transportation, or scheduling (22.6%) were rated of lower importance than most attitudinal barriers.

3.3 | Clinical characteristic as correlates of barriers to treatment

Table 2 shows bivariate associations of clinical characteristics with reported barriers to treatment. Almost all investigated clinical characteristics were associated with increased reporting of treatment barriers. The highest regression coefficients predicting the total barriers score were associated with having three or more disorders

TABLE 1 Perceived barriers to seeking treatment ($n = 9,939$)

	You are not sure available treatments are very effective % (SE)	You would want to handle the problem on your own % (SE)	You would be too embarrassed % (SE)	You would talk to friends or relatives instead % (SE)	You think it costs too much money % (SE)	You are unsure of where to go or who to see % (SE)	You anticipate problems with time, transportation, or scheduling % (SE)	You are afraid it might harm your school or professional career % (SE)
Unimportant	26.6 (0.7)	7.9 (0.4)	21.3 (0.6)	14.7 (0.6)	30.7 (0.7)	23.0 (0.7)	31.1 (0.7)	33.5 (0.7)
Of little importance	23.6 (0.6)	11.4 (0.5)	22.8 (0.7)	15.7 (0.6)	23.6 (0.7)	21.8 (0.6)	24.9 (0.7)	24.6 (0.7)
Moderately important	24.8 (0.7)	24.3 (0.7)	23.6 (0.7)	21.7 (0.7)	19.6 (0.6)	26.0 (0.7)	21.4 (0.6)	19.2 (0.6)
Important	17.8 (0.6)	32.4 (0.7)	20.2 (0.6)	27.7 (0.7)	15.2 (0.6)	22.1 (0.7)	15.3 (0.6)	13.7 (0.5)
Very important	7.1 (0.4)	24.0 (0.7)	12.0 (0.5)	20.3 (0.6)	10.9 (0.5)	7.2 (0.4)	7.3 (0.4)	9.1 (0.5)

Note. All analyses were conducted in the subsample of respondents that would not definitely seek treatment in case of a future emotional problem ($n = 9,939$; 75.4% of the total sample). To obtain pooled estimates of prevalence, each country was given an equal sum of weights.

Abbreviation: SE, standard error.

($b = 3.23$), broad mania ($b = 2.44$), and generalized anxiety disorders ($b = 2.30$). A similar picture occurred when predicting individual barriers, with clinical characteristics associated with increased reporting. The exception was “wanting to talk with friends instead,” which was inversely associated with most clinical characteristics (significant ORs ranging between 0.56 and 0.85).

When examining multivariate associations of these clinical characteristics predicting the summary count of number of barriers (Table 3), the best-fitting regression model, adjusted for socio-demographic, college-related, and treatment-related characteristics, included type of mental disorder as a significant predictor block within significant predictive associations for either number of disorders or suicidal thoughts and behaviors. The individual disorders most strongly related to barriers were generalized anxiety disorder ($b = 1.45$), broad mania ($b = 1.17$), alcohol use disorder ($b = 1.15$), and major depression ($b = 1.06$).

When examining multivariate associations of clinical characteristics predicting individual barriers, a more differentiated picture occurred. None of the specific barriers were predicted by all three types of clinical characteristics, that is, types of mental disorders, number of mental disorders, and suicidal thoughts and behaviors. After adjustment for all covariates (including the total barriers score), none of the three broad groups of clinical characteristics predicted the barriers “wanting to handle the problem on one's own,” “being unsure available treatments are very effective,” “being unsure of where to go or who to see,” and “anticipating problems with time, transportation, or scheduling” in the multivariate model. For each of the other barriers, different combinations of clinical characteristics were significant predictors. As in the bivariate models, and with only two exceptions, these associations were positive, which means that these specific barriers were significantly more likely to be reported by students with than without the clinical characteristics, above and beyond the effect of the total barrier score.

The first of the two exceptions to this general pattern was a negative association of number of disorders with embarrassment in a model that also included disorder types (which had significantly elevated ORs) as predictors. The negative associations of number with embarrassment in this model indicated that there are submultiplicative interactions of comorbid disorders with this barrier. That is, odds of embarrassment being a barrier are elevated among students with individual disorders (most notably major depression and generalized anxiety disorder), but this elevated risk is dampened among students with multiple disorders. The second exception was that several clinical characteristics were associated with significantly reduced odds of reporting wanting to talk to friends or relatives instead of a profession as a reason for not wanting to seek professional treatment.

3.4 | Predicting likelihood to seek treatment in case of an emotional problem

We also examined associations of treatment barriers and 12-month clinical characteristics in predicting reported intentions to seek treatment in case of a future emotional problem, again excluding from the analysis students who reported that they would definitely seek

TABLE 2 Bivariate associations of clinical characteristics predicting perceived barriers to seeking treatment ($n = 9,939$)

Predictor distribution ^a	% (SE)	Perceived barriers for seeking treatment								
		Perceived barriers for seeking treatment total score	You are not sure available treatments are very effective	You would want to handle the problem on your own	You would be too embarrassed	You would talk to friends or relatives instead	You think it costs too much money	You are unsure of where to go or who to see	You anticipate problems with time, transportation, or scheduling	You are afraid it might harm your school or professional career
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Type of 12-month mental disorder										
Major depressive episode	18.1 (0.6)	1.83 (0.16)*	1.23 (1.14–1.34)*	1.29 (1.18–1.41)*	1.71 (1.57–1.87)*	0.72 (0.66–0.79)*	1.59 (1.47–1.72)*	1.38 (1.27–1.51)*	1.43 (1.32–1.55)*	1.50 (1.38–1.63)*
Generalized anxiety disorder	16.1 (0.6)	2.30 (0.18)*	1.35 (1.23–1.47)*	1.21 (1.10–1.34)*	1.69 (1.54–1.86)*	0.84 (0.77–0.93)*	1.70 (1.55–1.86)*	1.42 (1.29–1.56)*	1.64 (1.50–1.80)*	1.65 (1.52–1.80)*
Panic disorder	4.2 (0.3)	1.91 (0.41)*	1.39 (1.12–1.73)*	1.17 (0.92–1.47)	1.36 (1.09–1.68)*	0.79 (0.62–1.00)	1.48 (1.23–1.77)*	1.32 (1.09–1.60)*	1.53 (1.24–1.88)*	1.74 (1.37–2.21)*
Broad mania	3.1 (0.3)	2.44 (0.36)*	1.42 (1.18–1.72)*	1.55 (1.27–1.89)*	1.51 (1.25–1.84)*	0.73 (0.60–0.88)*	1.48 (1.23–1.76)*	1.68 (1.38–2.05)*	1.48 (1.22–1.79)*	1.72 (1.43–2.06)*
Alcohol abuse or dependence	6.8 (0.4)	1.29 (0.23)*	1.17 (1.04–1.31)*	1.20 (1.06–1.37)*	1.20 (1.06–1.35)*	0.99 (0.87–1.11)	1.20 (1.06–1.36)*	1.15 (1.02–1.29)*	1.23 (1.08–1.40)*	1.35 (1.20–1.52)*
Drug abuse or dependence	3.1 (0.3)	0.78 (0.40)	1.21 (0.99–1.48)	1.31 (1.06–1.63)*	0.98 (0.80–1.20)	0.74 (0.60–0.92)*	1.34 (1.09–1.65)*	1.10 (0.89–1.35)	1.33 (1.08–1.64)*	1.14 (0.91–1.43)
Number of 12-month disorders										
Three or more	4.7 (0.4)	3.23 (0.34)*	1.57 (1.30–1.89)*	1.41 (1.16–1.72)*	1.78 (1.47–2.15)*	0.66 (0.54–0.81)*	2.07 (1.73–2.46)*	1.67 (1.41–1.99)*	1.98 (1.64–2.39)*	2.28 (1.90–2.72)*
Exactly two	8.9 (0.4)	2.35 (0.23)*	1.34 (1.19–1.50)*	1.33 (1.16–1.52)*	1.81 (1.60–2.05)*	0.76 (0.67–0.87)*	1.73 (1.55–1.94)*	1.42 (1.26–1.61)*	1.72 (1.54–1.92)*	1.70 (1.51–1.91)*
Exactly one	17.9 (0.6)	1.34 (0.16)*	1.16 (1.07–1.26)*	1.22 (1.12–1.32)*	1.51 (1.39–1.64)*	0.85 (0.78–0.93)*	1.32 (1.22–1.43)*	1.26 (1.16–1.38)*	1.23 (1.13–1.33)*	1.28 (1.18–1.38)*
None	68.5 (0.7)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
F (df_n, df_d)^b										
		$F_{3,1576} = 77.44^*$	$F_{3,624} = 18.27^*$	$F_{3,432} = 14.61^*$	$F_{3,465} = 64.54^*$	$F_{3,272} = 14.10^*$	$F_{3,813} = 58.56^*$	$F_{3,414} = 26.87^*$	$F_{3,1085} = 51.57^*$	$F_{3,616} = 58.34^*$
12-month suicidal thoughts and behaviors										
Planned or unplanned attempt	0.9 (0.1)	1.77 (0.75)*	1.18 (0.79–1.76)	1.17 (0.77–1.76)	1.91 (1.27–2.86)*	0.56 (0.38–0.83)*	1.81 (1.25–2.62)*	1.27 (0.86–1.88)	1.50 (1.02–2.20)*	2.09 (1.43–3.06)*
Plan, no attempts	7.8 (0.4)	1.25 (0.26)*	1.29 (1.13–1.47)*	1.29 (1.11–1.49)*	1.47 (1.29–1.68)*	0.52 (0.45–0.60)*	1.63 (1.42–1.87)*	1.25 (1.10–1.42)*	1.33 (1.16–1.53)*	1.59 (1.39–1.82)*
Ideation only	8.8 (0.4)	0.79 (0.23)*	1.13 (1.00–1.26)*	1.17 (1.04–1.33)*	1.40 (1.25–1.58)*	0.74 (0.66–0.83)*	1.41 (1.26–1.58)*	1.24 (1.10–1.38)*	1.19 (1.06–1.34)*	1.09 (0.97–1.22)
Never	82.6 (0.6)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
F (df_n, df_d)^b										
		$F_{3,2068} = 12.44^*$	$F_{3,569} = 5.63^*$	$F_{3,422} = 5.64^*$	$F_{3,716} = 23.58^*$	$F_{3,227} = 31.81^*$	$F_{3,511} = 28.69^*$	$F_{3,928} = 7.91^*$	$F_{3,415} = 9.07^*$	$F_{3,587} = 19.58^*$

Note. All analyses were conducted in the subsample that would not definitely seek treatment in case of a future emotional problem ($n = 9,939$; 75.4% of the total sample). All models adjusted for country membership.

Abbreviations: b, unstandardized regression coefficient; CI, confidence interval; OR, odds ratio; SE, standard error.

^aTo obtain pooled estimates of prevalence, each country was given an equal sum of weights.

^bF test to evaluate joint significance of predictor block. df_n = numerator degrees of freedom; df_d = denominator degrees of freedom.

* $p < .05$.

TABLE 3 Multivariate predictors for perceived barriers for seeking treatment ($n = 9,939$)

Type of 12-month mental disorder	Predictor distribution ^a % (SE)	Perceived barriers for seeking treatment total score <i>b</i> (SE)	Barriers			
			You would be too embarrassed	You would talk to friends or relatives instead	You think it costs too much money	You are afraid it might harm your school or professional career
			OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Major depressive episode	18.1 (0.6)	1.06 (0.19)*	1.48 (1.30–1.69)*	0.74 (0.65–0.84)*	1.06 (0.94–1.20)	0.98 (0.86–1.12)
Generalized anxiety disorder	16.1 (0.6)	1.45 (0.20)*	1.31 (1.12–1.55)*	0.86 (0.74–1.00)	1.09 (0.97–1.24)	0.98 (0.84–1.15)
Panic disorder	4.2 (0.3)	0.58 (0.42)	1.04 (0.77–1.41)	0.86 (0.64–1.16)	0.89 (0.70–1.14)	1.17 (0.88–1.57)
Broad mania	3.1 (0.3)	1.17 (0.37)*	1.07 (0.83–1.39)	0.74 (0.58–0.95)*	0.83 (0.67–1.03)	0.96 (0.75–1.23)
Alcohol abuse or dependence	6.8 (0.4)	1.15 (0.24)*	1.05 (0.90–1.22)	0.96 (0.83–1.11)	0.88 (0.76–1.02)	1.04 (0.90–1.21)
Drug abuse or dependence	3.1 (0.3)	0.22 (0.41)	0.89 (0.69–1.16)	0.91 (0.70–1.17)	1.20 (0.92–1.58)	0.75 (0.57–1.00)
$F(df_n, df_d)^b$		$F_{6,1076} = 32.81^*$	$F_{6,501} = 8.96^*$	$F_{6,260} = 4.41^*$	$F_{6,241} = 1.89$	$F_{6,64} = 0.47$
Number of 12-month disorders						
Three or more mental disorders	4.7 (0.4)	-	0.56 (0.38–0.82)*	1.30 (0.90–1.87)	-	1.46 (1.03–2.07)*
Exactly two mental disorders	8.9 (0.4)	-	0.79 (0.64–0.97)*	1.12 (0.91–1.39)	-	1.24 (0.98–1.57)
Exactly one mental disorder	17.9 (0.6)	-	(ref)	(ref)	-	(ref)
None	68.5 (0.7)	-	(ref)	(ref)	-	(ref)
$F(df_n, df_d)^b$			$F_{2,193} = 4.67^*$	$F_{2,386} = 1.39$		$F_{2,295} = 2.48$
12-month suicidal thoughts and behaviors						
Planned or unplanned attempt	0.9 (0.1)	-	1.27 (0.81–2.00)	0.69 (0.45–1.06)	1.39 (0.89–2.16)	1.67 (1.04–2.69)*
Plan, no attempts	7.8 (0.4)	-	1.10 (0.93–1.32)	0.61 (0.52–0.71)*	1.30 (1.10–1.54)*	1.33 (1.12–1.57)*
Ideation only	8.8 (0.4)	-	1.17 (1.03–1.32)*	0.79 (0.70–0.90)*	1.22 (1.06–1.40)*	0.92 (0.80–1.05)
Never	82.6 (0.6)	-	(ref)	(ref)	(ref)	(ref)
$F(df_n, df_d)^b$			$F_{3,764} = 2.40$	$F_{3,422} = 14.75^*$	$F_{3,323} = 5.08^*$	$F_{3,484} = 5.95^*$

Note. All analyses were conducted in the subsample that would not definitely seek treatment in case of a future emotional problem ($n = 9,939$; 75.4% of the total sample). Models with optimal model fit (based on Akaike information criterion) are shown. For four barriers (not sure available treatments are very effective, want to handle problems on own, not sure where to go or who to see, anticipated problems with time or travel or scheduling), mental disorders, number of mental disorders, and suicidal thoughts and behaviors were not significant as predictors; those barriers are not shown in the table. Each model includes the predictors shown in the rows, and adjusts for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, most important reason to go to university), perceived barriers for seeking treatment total score (in the models for individual barriers), country membership, past-year treatment, likelihood of seeking treatment in case of a future emotional problem, and stages of change.

Abbreviations: *b*, unstandardized regression coefficient; CI, confidence interval; OR, odds ratio; SE, standard error.

^aTo obtain pooled estimates of prevalence, each country was given an equal sum of weights.

^b*F* test to evaluate joint significance of predictor block. df_n = numerator degrees of freedom; df_d = denominator degrees of freedom.

* $p < .05$.

treatment. An inspection of bivariate associations indicated that all of the barriers were significant predictors, both that most of them were associated with increased rather than decreased odds of seeking treatment (Table 4). Clinical characteristics, in comparison, were associated with significantly reduced odds of seeking treatment.

With regard to multivariate associations, the best-fitting regression model to predict reported likelihood to seek treatment was the additive model that included barriers to treatment, type of mental disorder, and suicidal thoughts and behaviors but not number of Mental Health Disorders (MHDs). All barriers other than “thinking it costs too much money” were significant but again with many more of them associated with elevated than reduced odds of seeking treatment. “Wanting to handle the problem on ones’ own” was associated with the lowest odds of reported willingness to seek treatment (OR = 0.80) and “being unsure of where to go or who to see” with the highest odds (OR = 1.14). Clinical factors, in comparison, were consistently associated with significantly reduced odds of seeking treatment. These associations were significant for major depression (OR = 0.81), alcohol use disorder (OR = 0.75), 12-month suicidal plans (OR = 0.69), and 12-month suicide ideation without a plan (OR = 0.79).

4 | DISCUSSION

Only one fourth of college students stated that they would definitely seek treatment if they developed an emotional problem. This finding is indirectly consistent with research showing that a low proportion of college students with common mental disorders receive professional treatment (Bruffaerts et al., 2019). Responses to our questions about barriers provided some insights into the reasons for this low treatment rate.

The clearest pattern in the data was that attitudinal barriers are much more common than structural barriers, with the most commonly reported barriers being the preference to handle the problem on one's own, the wish to talk to friends or relatives instead, and being too embarrassed. Two of these three, preference to handle the problem on one's own and embarrassment, were the only two endorsed barriers associated with significantly reduced odds of reporting at least some intention to seek treatment in the future in the face of an emotional problem. This pattern is in line both with reports about barriers to seeking treatment among adults with mental disorders in the cross-national WMH surveys (Andrade et al., 2014) and with prior studies of barriers to treatment among students (Gulliver et al., 2010; Vidourek et al., 2014). This is an important pattern because these attitudinal barriers might be easier to overcome than structural barriers.

Most of the clinical characteristics considered here had significant and positive associations with most of the reported barriers and negative associations with intention to seek treatment. Furthermore, a positive dose–response relationship was found between the number of 12-month mental disorders the student had and the number of barriers the student endorsed. The sign of these associations might seem counterintuitive but is important to remember that the analysis excluded students who reported that they would definitely seek

treatment if they had a future emotional problem. A separate analysis (results available on request) found, not surprisingly, that students with 12-month mental disorders were more likely than those without such disorders to report that they would definitely seek treatment. It is only among students who reported at least some hesitation in this regard that presence of mental disorders was positively associated with extent of hesitation to seek treatment. This suggests that reported hesitation in the presence of actual need indicates stronger reluctance to seek treatment than it does in the absence of actual need.

There was evidence in the multivariate analysis of clinical characteristics predicting reported barriers that certain barriers are more common among students with some clinical characteristics than others. Most notably, major depression and generalized anxiety disorder were the disorders associated with highest odds of reporting embarrassment as a barrier to treatment. In light of this fact, interventions designed to increase the use of mental health services might take individual clinical characteristics into consideration in tailoring strategies. It is noteworthy that the few empirical studies that evaluated acceptance-facilitating interventions (Baumeister et al., 2014, 2015; Ebert et al., 2015; Lin, Faust, Ebert, Kramer, & Baumeister, 2018) did not take differences of this sort into consideration.

Two of the three most often mentioned reasons for not wanting to seek help, the wish to solve problems on one's own, and being too embarrassed, were also the only barriers independently associated with reduced intention to seek treatment after excluding students who reported that they definitely would seek treatment. It is plausible to think in light of this finding that digital delivered self-help approaches, which do not require the patient to disclose their problems to others (Ebert et al., 2018; Ebert, Cuijpers, Muñoz, & Baumeister, 2017), might be ideally suited to students reporting such barriers, in which case offering such interventions might help increase treatment among this hard-to-reach segment of the student population. This possibility is in line with the findings of another paper in this issue in which approximately one third of the students participating in an internet-based treatment for social anxiety disorder indicated that they would be unwilling to use face-to face psychotherapy (Kählke et al., 2019). Future research should explore to which extent students that are not willing to seek help with traditional forms of health care can be reached using such digital approaches.

Results of the present study should be seen in the context of a range of limitations. First, as pointed out in other papers' of this issue (Auerbach et al., 2018; Bruffaerts et al., 2019; Alonso, Vilagut et al., 2018) and related recent papers (Alonso, Mortier et al., 2018), the response rate in the WMH-ICS surveys was suboptimal across virtually all sites. Although all reported results are weighted using poststratification weights to adjust for differences between survey respondents and nonrespondents based on socio-demographic or college-related characteristics that were made available from university officials, a potential selection bias regarding other variables cannot be excluded. Second, clinical characteristics were assessed using fully structured self-report scales rather than clinical interviews. Despite evidence for good concordance between diagnoses based on these

TABLE 4 Multivariate associations of perceived barriers and 12-month clinical characteristics predicting reported likelihood of seeking treatment in case of a future emotional problem ($n = 9,939$)

	Predictor distribution ^a	Bivariate models ^b	Multivariate model ^c
	% (SE)	OR (95% CI)	OR (95% CI)
II. Perceived barriers to seeking treatment			
You are not sure available treatments are very effective	-	1.06 (1.02–1.09)*	1.04 (1.01–1.08)*
You would want to handle the problem on your own	-	0.82 (0.79–0.85)*	0.80 (0.77–0.83)*
You would be too embarrassed	-	0.94 (0.91–0.97)*	0.91 (0.88–0.94)*
You would talk to friends or relatives instead	-	1.06 (1.03–1.09)*	1.07 (1.04–1.10)*
You think it costs too much money	-	1.07 (1.04–1.10)*	1.03 (1.00–1.07)
You are unsure of where to go or who to see	-	1.14 (1.10–1.17)*	1.14 (1.10–1.18)*
You anticipate problems with time, transportation, or scheduling	-	1.11 (1.08–1.14)*	1.07 (1.03–1.11)*
You are afraid it might harm your school or professional career	-	1.07 (1.04–1.10)*	1.05 (1.01–1.08)*
	$F_{8,222}^d$	-	38.53*
IV. Type of 12-month mental disorder			
Major depressive episode	18.1 (0.6)	0.76 (0.69–0.83)*	0.81 (0.71–0.91)*
Generalized anxiety disorder	16.1 (0.6)	0.94 (0.84–1.04)	0.98 (0.87–1.12)
Panic disorder	4.2 (0.3)	1.04 (0.77–1.40)	1.07 (0.77–1.50)
Broad mania	3.1 (0.3)	0.78 (0.63–0.97)*	0.89 (0.71–1.12)
Alcohol abuse or dependence	6.8 (0.4)	0.74 (0.64–0.85)*	0.75 (0.64–0.87)*
Drug abuse or dependence	3.1 (0.3)	0.72 (0.57–0.91)*	0.85 (0.66–1.08)
	$F_{6,428}^d$	-	5.95*
VI. 12-month suicidal thoughts and behaviors			
Planned or unplanned attempt	0.9 (0.1)	0.70 (0.56–0.87)*	0.80 (0.51–1.26)
Plan, no attempts	7.8 (0.4)	0.84 (0.73–0.96)*	0.69 (0.58–0.82)*
Ideation only	8.8 (0.4)	0.82 (0.75–0.90)*	0.79 (0.69–0.91)*
Never	82.6 (0.6)	(ref)	(ref)
	F^d	10.43* ^e	8.17* ^f

Note: All analyses were conducted in the subsample that would not definitely seek treatment in case of a future emotional problem ($n = 9,939$; 75.4% of the total sample).

Abbreviations: CI, confidence interval; OR, odds ratio; SE, standard error.

^aTo obtain pooled estimates of prevalence, each country was given an equal sum of weights.

^bEach row shows a separate logistic regression model with likelihood of seeking treatment in case of a future emotional problem as the outcome variable, adjusting for country membership. Only bivariate associations for predictors that were included in the final multivariate model (i.e., the last column) are shown.

^cThe final (best-fitting) multivariate model adjust for socio-demographic (gender, age, parental educational level, parental marital status, place raised, religion, sexual orientation, and current living situation), college-related predictors (expected to work on a student job, academic performance in high school, most important reason to go to university), country membership, past-year treatment, stages of change, and for predictors shown in the rows.

^d F test to evaluate joint significance of predictor block with numerator degrees of freedom, denominator degrees of freedom.

^eThe degrees of freedom for this F value are $df_n = 3$, $df_d = 1023$

^fThe degrees of freedom for this F value are $df_n = 3$, $df_d = 580$.

* $p < .05$.

measures and those based on blinded clinical evaluations in previous studies, no clinical reappraisal studies of these scales have as yet been carried out in sample of college students. As a result, we cannot exclude the possibility of bias in estimates of mental disorders. Third, we only assessed hypothetical intention to seek mental health treatment. Although this generally viewed as a useful best proximal indicator, it does not always translate directly to actual use of services

(Webb & Sheeran, 2006). Therefore, we plan to use future prospective WMH-ICS data to examine the association of barriers reported in the baseline survey with subsequent treatment over the next year of college. Fourth, the changes of stages scale assessed the readiness to seek help in case of emotional or substance use problems in one item, and this item did also not differentiate between different types of emotional problems, for example, depression versus suicidal

behaviors. We cannot exclude that responses regarding stages of change might have differed if assessed separately for different types of emotional- or substance-related problems. Finally, we neither examined a broad range of potentially relevant predictors nor considered relevant interactions between different student characteristics in the prediction of intention to seek treatment. Expanded investigations of that sort are needed in future iterations of the WMH-ICS survey.

Within the context of these limitations, the study has a number of important implications. First, we showed clearly that the majority of students reported at least some hesitation to seek treatment for emotional problem and that psychological barriers are paramount, thereby arguing that the treatment gap that exists among college students cannot be closed entirely by doing nothing more than increasing access to treatment. Much existing implementation research designed to increase use of existing services has been limited to descriptive studies of barriers along the lines of those studied in this report (Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015). Future research needs to implement controlled trials to evaluate concrete strategies to reduce barriers in an effort to increase treatment. Failure to do this has resulted in criticisms of prior research on barriers to treatment lacking external validity (Pressler & Kaizar, 2013). We plan to implement such experiments in future iterations of the WMH-ICS surveys, as these surveys give us unique access to students with current mental disorders who have not sought treatment. Our initial efforts along these lines are described in another paper of this issue (Ebert et al., 2018).

DECLARATION OF INTEREST STATEMENT

Dr. Ebert has served as a consultant to/on the scientific advisory boards of Sanofi, Novartis, Minddistrict, Lantern, Ideamed, Schoen Kliniken, Agaplesion, and German health insurance companies (BARMER, Techniker Krankenkasse). He is also stakeholder of the Institute for health training online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care. In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. Drs. Mortier, Auerbach, Alonso, Bantjes, Benjet, Cuijpers, Greif Green, Hasking, Nock, O'Neill, Pinder-Amaker, Vilagut, Zaslavsky, Bruffaerts, and Ms. Sampson report no biomedical financial interests or potential conflicts of interest.

ACKNOWLEDGMENTS

Funding to support this initiative was received from the National Institute of Mental Health (NIMH) R56MH109566 (R. P. A.), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or NIMH; the Belgian Fund for Scientific Research (11N0514N, 11N0516N, and 1114717N) (P. M.); the King Baudouin Foundation

United States (2014-J2140150-102905) (R. B.); Eli Lilly and Company (IIT-H6U-BX-I002) (R. B. and P. M.); BARMER, a health care insurance company, for project StudiCare (D. D. E.); ZonMw (Netherlands Organisation for Health Research and Development; Grant 636110005); the PFGV (Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (P. C.); South African Medical Research Council and the Ithemba Foundation (D. J. S.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440), Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya (2017 SGR 452), FPU (FPU15/05728) (J. A.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III—FEDER (PI13/00506) (G. V.); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (T. B.); Consejo Nacional de Ciencia y Tecnología (CONACyT) Grant CB-2016-01-285548 (C. B.). The World Mental Health International College Student (WMH-ICS) initiative is carried out as part of the WHO World Mental Health (WMH) Survey Initiative. The WMH survey is supported by the National Institute of Mental Health (NIMH) R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (R. C. K.). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for the assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH-ICS publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

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How to cite this article: Ebert DD, Mortier P, Kaehlke F, et al. Barriers of mental health treatment utilization among first-year college students: First cross-national results from the WHO World Mental Health International College Student Initiative. *Int J Methods Psychiatr Res*. 2019;28:e1782. <https://doi.org/10.1002/mpr.1782>

Increasing intentions to use mental health services among university students. Results of a pilot randomized controlled trial within the World Health Organization's World Mental Health International College Student Initiative

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Funding information

National Institute of Mental Health (NIMH), Grant/Award Numbers: R01MH070884 and R56MH109566; Belgian Fund for Scientific Research, Grant/Award Numbers: 1114717N, 11N0516N and 11N0514N; King Baudouin

Abstract

Background: The majority of university students with mental health problems are untreated. Only a small empirical literature exists on strategies to increase mental health service use.

Aims: To investigate the effects and moderators of a brief acceptance-facilitating intervention on intention to use mental health services among university students.

Method: Within the German site of the World Health Organization's World Mental Health International College Student (WMH-ICS) initiative, 1,374 university students were randomized to an intervention condition (IC; $n = 664$) or a control condition (CC; $n = 710$) that was implemented in the survey itself. Both conditions received the questions assessing mental disorders and suicidality that were included in other WMH-ICS surveys. The IC group then additionally received: Internet-based personalized feedback based on subject symptom severity in the domains of depression, anxiety, substance use, suicidal thoughts and behaviors, and nonsuicidal self-injury; psychoeducation tailored to the personal symptom profile; and information about available university and community mental health services. The primary outcome was reported intention to use psychological interventions in the next semester, which was the last question in the survey. A broad range of potential moderating factors was explored.

Results: There was a significant main effect of the intervention with students randomized to IC, reporting significantly higher intentions to seek help in the next semester than students in the CC condition ($d = 0.12$, 95% CI: 0.02 to 0.23). Moderator analyses indicated that the intervention was more effective among students that fulfilled the criteria for lifetime ($d = 0.34$; 95% CI: -0.08 to 0.7) and 12-month panic-disorder ($d = 0.32$; 95% CI: -0.10 to 0.74) compared with those without lifetime ($d = 0.11$; 95% CI: 0.00 to 0.22) or 12-month panic disorder ($d = 0.11$; 95% CI: 0.00 to 0.22), students with lower ($d = 0.37$; 95% CI: -0.77 to 1.51) than higher ($d = -0.01$;

Foundation, Grant/Award Number: 2014-J2140150-102905; Eli Lilly, Grant/Award Number: IIT-H6U-BX-1002; BARMER; Netherlands Organisation for Health Research and Development (ZonMw), Grant/Award Number: 636110005; Protestants Fonds voor de Geestelijke Volksgezondheid (PFGV); South African Medical Research Council; Ithemba Foundation; Instituto de Salud Carlos III-FEDER, Grant/Award Numbers: 00506 and PI13; DIUE Generalitat de Catalunya; Northern Ireland Public Health Agency and Ulster University; Consejo Nacional de Ciencia y Tecnología (CONACyT), Grant/Award Number: CB-2016-01-285548; John D. and Catherine T. MacArthur Foundation; Pfizer Foundation; United States Public Health Service, Grant/Award Numbers: R01-DA016558, R01-MH069864 and R13-MH066849; Fogarty International Center (FIRCA), Grant/Award Number: FIRCA R03-TW006481; Pan American Health Organization; Ortho-McNeil Pharmaceutical; GlaxoSmithKline; Bristol-Myers Squibb

95% CI: -0.36 to 0.34) self-reported physical health, and students with nonheterosexual ($d = 0.38$; 95% CI: 0.08 to 0.67) compared with heterosexual ($d = 0.06$; 95% CI: -0.06 to 0.17) sexual orientation. The intervention had no effects among students who reported that they recognized that they had an emotional problem and “are already working actively to change it” (Stage 4 “stages of change”).

Conclusions: A simple acceptance-facilitating intervention can increase intention to use mental health services, although effects, are on average, small. Future studies should investigate more personalized approaches with interventions tailored to barriers and clinical characteristics of students. In order to optimize intervention effects, the development and evaluation should be realized in designs that are powered to allow incremental value of different intervention components and tailoring strategies to be evaluated, such as in multiphase optimization designs.

KEYWORDS

health behavior, psychoeducation, public mental health, risk factors

1 | INTRODUCTION

Mental disorders are highly prevalent among university students, with 12-month prevalence rates ranging from 20% to 45% (Auerbach et al., 2016; Blanco et al., 2008; Bruffaerts et al., 2018). Anxiety, mood, and substance use disorders are the most widespread mental disorders among these students (Auerbach et al., 2016). Despite the wide availability and well-known efficacy of interventions (Cuijpers et al., 2013), the majority of university students with mental disorders remain untreated (Auerbach et al., 2016; Blanco et al., 2008; Demyttenaere et al., 2004; Eisenberg, Golberstein, & Hunt, 2009; Larisch et al., 2013). Utilization rates range from 5–42.4% among those suffering from alcohol and drug problems, 16–45% among those with anxiety disorder, and 24.5–57.5% among those with suicidal thoughts and behaviors (Bruffaerts et al., this issue, Blanco et al., 2008).

In addition to the obvious importance of structural barriers, reasons for low treatment rates include knowledge-related and attitudinal barriers such as lacking knowledge about mental health services (Gulliver, Griffiths, & Christensen, 2010), limited mental health literacy (Jorm et al., 1997) fear of stigmatization (Clement et al., 2015; Gulliver et al., 2010), and the wish to deal with problems on their own (Gould et al., 2004; Gulliver et al., 2010; Mojtabai et al., 2011). Moreover, low risk-perception (Brewer et al., 2007; Gulliver et al., 2010) expressed as either an inability to identify psychopathological symptoms (Biddle, Donovan, Sharp, & Gunnell, 2007) or an inability to identify the need of treatment despite acknowledging symptoms (Eisenberg, Golberstein, & Gollust, 2007; Mojtabai et al., 2011) has been found to predict low rates of seeking treatment for emotional problems.

Given that the impact of even the most effective interventions is low when utilization is low in the target population (Ebert et al., 2015), research on effective strategies to overcome such nonstructural barriers is of utmost importance. However, only limited empirical research exists on acceptance-facilitating interventions (AFIs) designed to increase treatment uptake.

One of the most commonly used strategies in AFIs for mental disorders is giving information about relevant symptom clusters in the form of personalized risk feedback (Donker, Griffiths, Cuijpers, & Christensen, 2009; Lewis & Neighbors, 2006; Riper et al., 2009). This approach has shown promising effects in increasing intention to participate in preventive medical procedures (Albada, Ausems, Bensing, & van Dulmen, 2009; Brouwers et al., 2011; Curry, Taplin, Anderman, Barlow, & McBride, 1993; Hovick, Wilkinson, Ashida, de Heer, & Koehly, 2014; Sheridan et al., 2011) and in reducing the alcohol consumption of problem drinkers (Riper et al., 2009). However, other experimental evaluations of the effects of personalized risk feedback to increase treatment for mental health problems have yielded weak results (Chan et al., 2016; King et al., 2015; Quinlivan et al., 2014; Quinlivan et al., 2016), although one study reported an effect on utilization in some subgroups (Batterham, Cleave, Sunderland, Carragher, & Brewer, 2016). Contrarily, more consistent evidence exists for positive effects of AFIs based on psychoeducation in changing attitudes toward help-seeking behavior (Gonzales, Tinsley, & Kreuder, 2002; Gulliver, Griffiths, Christensen, & Brewer, 2012; Hadlaczky, Hökby, Mkrтчian, Carli, & Wasserman, 2014).

Despite these promising findings, AFI experiments are few in number (Cranen, Veld, in't, & Vollenbroek-Hutten, 2011) and have never before been carried out among university students. More research is needed to increase the proportion of students who receive treatment given the high prevalence and burden of untreated mental disorders in this group (Bruefferts et al., this issue; Alonso et al., this issue). The current study was designed to evaluate an AFI administered to German university students. The AFI combined (a) personalized risk feedback with (b) brief tailored psychoeducation on personal symptoms and mental health treatments and (c) information about available on-campus and community mental health facilities. We evaluated the effects of this AFI on reported intentions to seek help during the next semester among students regardless of the presence of a mental disorder. We also aimed to examine in an exploratory manner a broad range of potential moderators of AFI effects in order

to help inform future intervention refinements that might include tailoring intervention messages to specific student characteristics.

2 | METHODS

2.1 | Design and procedures

Within the World Health Organization's (WHO) World Mental Health International College Student (WMH-ICS) initiative, representative surveys examining the mental health of students were carried out in eight countries. StudiCare, the WMH-ICS survey in Germany, was carried out at two German universities: the Friedrich-Alexander-University Erlangen-Nuremberg (FAU) and the University of Ulm. The current experiment was embedded within these surveys.

All students of these universities received a personalized e-mail invitation to participate in a student survey at the beginning of the semester. The e-mail contained a short explanatory message as well as a personalized link to the questionnaire. If the student was over the age of 18 years and gave their consent to participate, they could proceed with completing the survey. Students received up to six reminder emails to encourage them to complete the survey. These recruitment procedures were the same for both experimental groups. The procedures were approved by the medical ethical committee of the FAU, all participants provided informed consent. The study was not preregistered in a clinical trial register.

In total, 11,169 students were invited to participate in the study, of which 2,895 started the WMH-ICS survey (25.92%). Due to incremental drop-out throughout the questionnaire, merely 1,374 first-year ($n = 1,036$) and second-year ($n = 338$) students finished the regular survey (drop-out rate 52.54%) and were therefore eligible for the present study. All eligible students were randomized into either the intervention condition (IC; $n = 664$) or the control condition (CC; $n = 710$). Randomization was performed on an individual level by independent university administration staff and there was no way that researchers could foresee allocation of individual participants. Participants in the IC received the AFI whereas those in the CC did not receive any additional form of intervention. Intention to use mental health services in the next semester was subsequently assessed in both groups. Only students that completed the WMH-ICS survey entered the study. The AFI was embedded in the survey WMH-ICS survey, immediately following the regular survey questions. Intention to seek help (the primary outcome) was assessed as the last item of the WMH-ICS survey in both study conditions.

2.2 | Intervention

Embedded in the regular WMH-ICS survey (for a description of procedures, see Auerbach et al., this issue), students randomized to the IC received (a) personalized feedback based on their symptom severity, (b) tailored psychoeducation, and (c) information about mental health services. Aiming to reduce the barrier of "low risk awareness" (Brewer et al., 2007; Eisenberg et al., 2007; Gulliver et al., 2010; Mojtabai et al., 2011), personalized feedback included information about their individual symptom severity in the symptom areas "depressed mood"

(Kroenke & Spitzer, 2002); "worries, fears, and tensions" (Spitzer, Kroenke, Williams, & Löwe, 2006); "self-injuring behavior" including suicidal thoughts, plans, attempts, and nonsuicidal self-injury (adapted from SITBI; Nock, Holmberg, Photos, & Michel, 2007), and "substance use" (Kessler & Üstün, 2004; Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). Based on whether students exceeded a specified cut-off (yes/no) they received the information if their symptom severity was either low or above average in each of the assessed areas. This part of the AFI aimed to reduce the barrier of low-risk awareness. Subsequently, psychoeducation on symptoms tailored on the individual symptom profile was provided to address the barrier of "low mental health literacy" (Biddle et al., 2007; Gulliver et al., 2010) and "limited outcome expectancies" (Eisenberg et al., 2007; Mitchell & Gordon, 2007) when addressing individual symptoms. A total of 14 different feedback profiles, based on type of symptom area as well as the number of symptom clusters in which the participants exceeded the cut-off (0–4) were created. Psychoeducation included information about symptoms, frequency in the student population, the potential of reducing symptoms, and increasing well-being using psychological interventions. Finally, information about mental health services were provided to address potential barriers of "insufficient knowledge about mental health services" (Gulliver et al., 2010) and "ease of access" (Gulliver et al., 2010). These information were not tailored to the symptom profile and included services available through the university, in community care (general practitioner, psychotherapist, psychiatrist or, inpatient clinic), as well as locally independent services such as mental health crisis hotlines and Internet-based mental health interventions offered within the German WMH-ICS initiative (<http://www.studicare.com>). Special emphasis was given to use positive, encouraging, and nonstigmatizing wording.

The AFI was presented in the form of a PDF file that the participants could download. The majority was in written form, but the personalized feedback was given by a customized graphic representation of the student's symptom severity. There was no technical way to control whether the participants had read the (entire) feedback before they answered the final question.

2.3 | Measures/outcomes

2.3.1 | Primary outcome

The primary outcome was the intention to use psychological interventions in the next semester, operationalized through the question: "How likely would you be to use any services regarding mental health (e.g., Internet-based intervention, psychological counseling, family doctor, and psychotherapy) in the next semester?"

2.3.2 | Moderators

The following variables were assessed as potential effects modifiers:

Lifetime and 12-month mental disorders

Major depressive episode (MDE), generalized anxiety disorder (GAD), panic disorders (PD), broad mania, and drug abuse or dependence

were assessed using the validated self-report screening scales (Composite International Diagnostic Interview Screening Scales) of the widely used Composite International Diagnostic Interview (CIDI) scales (Kessler et al., 2013; Kessler & Üstün, 2004). These scales correlate highly with blinded clinical diagnoses based on the Structured Clinical Interview for DMS-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1994), with a ranging area under the curve (AUC) from 0.70 to 0.78 (Kessler et al., 2013; Kessler, Calabrese, et al., 2013). Alcohol abuse or dependence were assessed using a version of the alcohol use disorders identification test (AUDIT; Saunders et al., 1993), with a total score of 16+ or a score 8–15 with 4+ on the AUDIT dependence questions as a definition for alcohol use disorder (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). The concordance of the AUDIT with clinical diagnoses is in the range of AUC = 0.78 to 0.91 (Reinert & Allen, 2002).

Suicidal thoughts and behaviors

Lifetime and 12-month suicidal thoughts and behaviors (STBs) were assessed using a modified version of the Columbia Suicidal Severity Rating Scale (Posner et al., 2011). The respective questions were: “Did you ever wish you were dead or would go to sleep and never wake up?” and “Did you ever in your life have thoughts of killing yourself?” for suicidal ideation, “Did you ever think about how you might kill yourself (e.g., taking pills or shooting yourself) or work out a plan of how to kill yourself?” for suicide plans, and “Have you ever made a suicide attempt (i.e., purposefully hurt yourself with at least some intent to die)?” for attempted suicide.

Nonsuicidal self-injury

Nonsuicidal self-injury (NSSI) was assessed using an adapted version of the Self Injurious Thoughts and Behaviors Interview (Nock et al., 2007) using the items “Did you ever do something to hurt yourself on purpose, without wanting to die (e.g., cutting yourself, hitting yourself, or burning yourself)?”, “About how old were you the very first time you did something to hurt yourself on purpose, without wanting to die?”, “About how many times in your life did you do something to hurt yourself on purpose, without wanting to die?”, and “How many times in the past year did you do something to hurt yourself on purpose, without wanting to die?”

Subjective health

Mental Health as well as physical health was rated from brilliant to bad (1 = brilliant, 2 = very good, 3 = good, 4 = acceptable, 5 = bad). Besides the average days per month (during last year) that were lost due to health, the subjective high energy level in the last month was assessed (1 = all or most of the time, 2 = sometimes, 3 = almost never or never).

Sociodemographics

Age (categorized into three categories [18 years/19 year/20 or more years old]), gender (male, female, transgender [male-to-female, female-to-male], other), family status (single, “in a relationship”, “married or relationship with common household”, “divorced without a new relationship”, and “divorced with a new relationship”), sexual orientation (categorized into heterosexual with no same-sex attraction,

heterosexual with some same-sex attraction, nonheterosexual without same-sex sexual intercourse, nonheterosexual with same-sex sexual intercourse, and asexual), and religious preference (Christian, Jewish, Muslim, another, or none).

College-related variables

Full-time/part time student status, study subject, current semester (first-year students vs. older students), expected to work alongside university (yes/no), self-perceived academic performance in high school relative to peers from top 5% to bottom 10%, and categorized in upper and bottom half). Additionally, participants were asked about their reason to go to university, examining the most important one as well. Based on the results of a tetrachoric factor analysis, participants were categorized into those whose most important reason to go to university was intrinsic (i.e., achieving a degree, enjoying and studying, studying a subject that really interested them, improving job prospects generally, and training for specific type of job) or extrinsic (i.e., family wanted them to go, friends are going, teachers advised them, and did not want to get a job right away).

Treatment utilization

Lifetime and current utilization of psychological counseling, psychotherapy, and medication for any emotional or substance use problem was assessed by asking participants whether they ever received psychological counseling, psychotherapy, or medication for an emotional or substance problem, as well as the age of the first and last time they received medication or counseling (Kessler & Üstün, 2004; Ursano et al., 2014).

Intention to use mental health service

Intention to utilize mental health services in case of future emotional problems was assessed using items from the Army study to assess risk and resilience in servicemembers (Ursano et al., 2014), asking participants “If during this coming school year, you developed an emotional problem that caused you a lot of distress and interfered with your school work, how likely would you be to go to the student Counseling Center for help?”, “How likely would you be to go somewhere else for help, like to your doctor, a mental health professional, or religious advisor?” (definitely would go, probably would go, might or might not go, probably would not go, definitely would not go).

Barriers of treatment utilization

If participants indicated that they “definitely would not go” to seek help, they were asked about potential reasons: “If you decided not to seek help if you developed such a problem, how important do you think each of these would be as reasons for not seeking help?”. Those were: “You are not sure available treatments are very effective”; “You would want to handle the problem on your own”; “You would be too embarrassed”; “You would talk to friends or relatives instead”; “You think it costs too much money”; “You are unsure of where to go or who to see”; “You anticipate problems with time, transportation, or scheduling”; “You are afraid it might harm your school or professional career”; “You are afraid of different treatment from others”; and “Other reasons” (1 = very important; 2 = important;

3 = moderately important; 4 = somewhat important; 5 = unimportant). Additionally, barriers for which students indicated they are “very important” to “important” were categorized as “relevant” (yes), all the others as nonrelevant (no). A total barriers sum score was calculated.

Readiness to change

The readiness to change potential emotional or substance-related problems were assessed using five items related to the stages of change model (Aad, Miller, & Tonigan, 1996) “How would you rate your readiness or willingness to change any emotional or substance use problems you are experiencing at this time”; Stage 1 = I do not have a problem that I need to change; Stage 2 = I have a problem, but I am not yet sure I want to take action to change it; Stage 3: I have a problem and I intend to address it; Stage 4 = I have a problem and I already am working actively to change it; Stage 5 = I had a problem but I have addressed it and things are better now (yes/no).

2.4 | Analyses

All analyses were conducted using SPSS Version 25 (IBM Corp., 2017). The sample size was not priori restricted, the achieved sample size allowed us to detect significant differences between the groups of $d = 0.15$, with a power of 80%. To account for nonresponse to the survey invitation, participants were weighted using propensity scores based on sociodemographic and college-related variables made available by college officials (Groves & Couper, 1998). Because only participants who completed the WMH-ICS survey items were randomized, no missing data occurred and thus no imputation method was used. Differences between the IC and the CC in intentions to utilize mental health services in university and community care in the next semester were examined using a *t*-test. To identify potential intervention effect modifiers in an explorative manner, moderator analyses were performed using a series of linear multiple regression analyses with bootstrapped 95% CI (5,000 bootstrap samples), utilizing the SPSS macro PROCESS 3.0 (Hayes, 2013). Moderation variables were neither standardized nor mean-centered before the analysis, because it doesn't impact the moderation effect and could possibly harm the interpretation if dichotomous variables are modified before the analysis. (Hayes, 2013). Although moderator analyses were intended to be exploratory, no alpha adjustment was made for multiple testing in order to avoid false-negative findings (Kraemer, Wilson, Fairburn, & Agras, 2002). Cohen's *d*'s and 95% CI were calculated comparing the means and standard deviations of the IC and CC on the primary outcome. According to Cohen, $d = 0.2$ can be considered a small effect, $d = 0.5$ a medium, and $d = 0.8$ a large effect (Cohen, 1992). To increase interpretability, the number needed to be treated (NNT) indicating the number of participants having received the AFI to generate one additional student to intend to use mental health services was calculated based on the formula of Kraemer and Kupfer (2006). Statistical significance in all analyses was set at $\alpha < 0.05$ (two-sided).

3 | RESULTS

3.1 | Sample description

In total and after weighting, 1,375 survey respondents (671 IC, 704 CC) were included in the analyses. Descriptive characteristics of the sample were similar across the IC and CC subgroups. (Table 1) In the total sample, 23.7% of participants stated a nonheterosexual sexual orientation, 64.8% answered that they were currently in a relationship, and the vast majority stated that they were of German nationality (91.2%). The majority of survey respondents had a Christian religious preference (70.6%), with another 6% having another religious preference, and 23.4% no religious preference. Nearly all participants studied in full-time (98.7%), with science (16.2%), engineering (14.6%) and teaching (12.8%) being the most popular study subjects. 85.7% of students ranked themselves as being in the upper half of the class on their academic achievements and 76% expected to work in a student job at some point in the school year. There was much higher endorsement of intrinsic than extrinsic reasons for going to college, with an average of 3.6 intrinsic reasons and 1.2 extrinsic reasons.

As can be seen in Table 2, the burden of mental disorders in the sample was quite high and, as with the background characteristics examined in Table 1, quite comparable among students in the IC and

TABLE 1 Sociodemographic and college-related variables. ($n = 1,375$)

	Distribution in percent		
	Intervention condition	Control condition	Overall
Sociodemographic			
Age 18 years	17.4	15.9	16.6
Age 19 years	23.8	26.2	25.0
Age 20 years	58.8	58.0	58.4
Being female	48.8	52.1	50.50
Being currently in a relationship	40.0	39.5	39.7
German nationality	89.9	92.5	91.2
experienced discrimination	9.6	12.1	10.9
being nonheterosexual	15.3	12.2	13.7
Religion			
Christian	68.4	72.8	70.6
Another religion	6.3	5.6	6.0
No religion	25.3	21.6	23.4
College-related information			
Studying full-time	98.7	98.6	98.7
First year student	60.6	65.1	62.9
Expected to work on a student job	74.8	78.4	76.0
Self-reported ranking high school bottom 50%	15.9	12.8	14.3
Self-reported ranking high school top 50%	84.1	87.2	85.7
Most important reason to go to college extrinsic	4.6	7.8	6.2

Note. The results are based on weighting using propensity scores based on sociodemographic and college-related variables made available by college officials.

TABLE 2 Clinical characteristics mental health and suicidal thoughts and behaviors ($n = 1,375$)

	Distribution in percent or mean (SD)					
	Intervention condition		Control condition		Overall	
	12-month	lifetime	12-month	lifetime	12-month	lifetime
Type of mental disorder						
Major depressive episode	22.4	24.4	19.9	21.1	20.7	22.7
Generalized anxiety disorder	14.3	15.4	12.2	13.5	13.3	14.4
Panic disorder	6.2	6.3	6.8	7.2	6.5	6.7
Broad mania	2.4	4.0	3.7	4.1	3.1	4.0
Alcohol abuse or dependence	2.8	3.0	2.9	2.9	2.8	2.9
Drug abuse or dependence	3.6	5.4	2.6	4.5	3.1	4.9
Number of mental disorders						
None	67.6	64.5	67.8	65.0	67.7	64.8
Exactly one mental disorder	19.1	20.8	20.4	20.8	19.8	20.8
Exactly two mental disorders	8.6	8.8	9.1	10.8	8.9	9.8
Three or more mental disorders	4.7	5.8	2.1	3.4	3.7	5.6
Mean (SD)	0.52 (0.89)	0.58 (0.96)	0.47 (0.79)	0.54 (0.84)	0.49 (0.84)	0.56 (0.90)
Suicidal thoughts and behaviors						
Never	64.9	31.0	70.8	37.1	67.9	34.2
Ideation only	22.3	42.0	20.1	39.9	21.1	40.9
Plan, no attempts	12.4	23.1	8.8	20.1	10.6	21.5
Planned or unplanned attempt	0.4	3.9	0.3	2.9	0.4	3.4
NSSI	7.8	23.5	5.8	18.4	6.8	20.9
Subjective Health^a						
Self-rated mental health	2.83 (1.093)		2.70 (0.999)		2.77 (1.047)	
Self-rated physical health	2.63 (0.865)		2.65 (0.916)		2.64 (0.891)	

Note. NSSI: nonsuicidal self injury SD: standard deviation.

^aLower score equal better subjective health (1 = "brilliant"; 5 = "bad")

CC. Approximately, one-third of all students experienced at least one lifetime (35.2%) and 12-month (32.3%) mental disorder. The most often reported 12-month disorder was MDE (20.7%) followed by GAD (13.3%) and PD (6.5%). Twelve-month STBs and NSSI were common as well with one in five students of the sample reporting suicidal ideation (21.1%), one in 10 suicidal plans (10.6%), 0.4% a suicidal attempt, and 6.8% NSSI.

We also examined lifetime treatment for emotional or substance-related problem. (See online Table S1) and found that the distribution was quite comparable for students in the IC and CC conditions. Around 12.6% reported lifetime utilization of psychotherapy and 7.3% medication for emotional problems. Regarding intention to use future mental health services, 23.2% indicated that they would never use any mental health service in case of a future emotional or substance-related problem. The barriers to utilization among students who said they would not definitely use mental health services in case of a future emotional problems were primarily attitudinal, including the wish to handle their problems on their own (64.7%), preference to talk to friends or relatives rather than a mental health professional (50.8%), fear of a different treatment from others (39.4%), embarrassment (33.6%), or not knowing where to go for help (28.7%).

Concerning readiness to change, 65.8% could be categorized in Stage 1 (I do not have a problem that I need to change), 10% in Stage 2 (I have a problem, but I am not yet sure I want to take action to

change it), 6.9% in Stage 3 (I have a problem and I intend to address it), 9.5% in Stage 4 (I have a problem and I already am working actively to change it), and 7.8% in Stage 5 (I had a problem but I have addressed it and things are better now).

3.2 | Primary outcome

There was a significant main effect of the AFI, with students randomized to receive the IC indicating significantly higher intentions to seek help in the next semester compared with participants of the CC ($p = 0.024$). With $d = 0.12$ (95% CI: 0.02 to 0.23) in the total sample, the magnitude of the effect size was small according to Cohen's criteria. The NNT to achieve one additional student intending to utilize mental health service in the next semester was 14.71 (95% CI: 83.33 to 7.69). For details see Table 3.

3.3 | Moderator analysis

Lifetime ($p = 0.0459$) and 12-month ($p = 0.0493$) DSM-IV panic disorder, self-reported physical health ($p = 0.0067$), being or not being in Stage 4 of the stages of change model ($p = 0.0487$), as well as sexual orientation ($p = 0.01555$) were found to significantly moderate the

TABLE 3 Primary outcome analysis, t-Test Cohen's *d*, and NNT (*n* = 1,375)

Outcome	Difference in means (95% CI)	Cohen's <i>d</i> (95% CI)	NNT (95% CI)	two-sample-t (1374)	IC mean (SD)	CC mean (CC)
Intention to use psychological intervention in the next semester	0.1198 (0.02; 0.22)	0.12 (0.02; 0.23)	14.71 (83.33; 7.69)	2.246 (<i>p</i> = 0.024)	2.249 (0.9729)	2.130 (0.9930)

Note. CC: control condition; CI: confidence interval; IC: intervention condition; NNT: numbers needed to be treated; SD: standard deviation. The results are based on weighting using propensity scores based on sociodemographic and college-related variables made available by college officials.

effect of the AFI on the intention to use psychological interventions in the next semester, when compared with the CC.

Significantly, larger effects were observed for those students that fulfilled the criteria for lifetime ($d = 0.34$; 95% CI: -0.08 to 0.7) and 12-month panic disorder ($d = 0.32$; 95% CI: -0.10 to 0.74) compared with those without lifetime ($d = 0.11$; 95% CI: 0.00 to 0.22) or 12-month panic disorder ($d = 0.11$; 95% CI: 0.00 to 0.22). NNT to achieve one additional student to intend to seek help was 5.26 for lifetime and 5.56 for 12-month panic disorder, compared with the control group.

Students with lower self-reported physical health ($d = 0.37$; 95% CI: -0.77 to 1.51; NNT = 4.85; for "bad") showed significantly larger effects compared with those with higher self-reported physical health ($d = -0.01$; 95% CI: -0.36 to 0.34; for "brilliant").

Moreover, although no effects of the AFI were found for students that stated, "to have a problem and are already working actively to change it" (Stage 4 stages of change; $d = -0.25$; 95% CI: -0.59 to 0.10), significant findings were found for those students that indicated not to be in this stage ($d = 0.18$; 95% CI: 0.06 to 0.29; NNT = 9.8). Larger effects were also found for nonheterosexual oriented students ($d = 0.38$; 95% CI: 0.08 to 0.67; NNT = 4.72) compared with those with a heterosexual orientation ($d = 0.06$; 95% CI: -0.06 to 0.17; NNT = 29.41).

All other variables did not significantly moderate the AFI's effect on intention to utilize mental health services in the next semester (ranging from $p = 0.08$ for Stage 2 of the stages of change to $p = 0.99$ for 12-month suicidal ideation). There was a trend ($P < 0.10$) for 12-month MDE, lifetime alcohol abuse or dependence, being in stage two of the stages of change (I have a problem, but I am not yet sure I want to take action to change it; see Table S2).

4 | DISCUSSION

This study found significant effects of an automated, simple AFI on students' intention to seek mental health service in the next semester compared with an untreated CC. Explorative moderator analyses indicated the AFI is more effective among students with lifetime or 12-month PD compared with those without, and among students with lower compared with higher physical health, and those indicating not to already be working actively on the problem, or nonheterosexual students compared with heterosexual ones. These findings are comparable with previous studies in other target groups showing that it may be possible to increase the intention to seek help (Albada et al., 2009; Brouwers et al., 2011; Curry et al., 1993; Gonzales et al., 2002; Gulliver et al., 2012; Hadlaczky et al., 2014; Hovick et al., 2014; Riper et al., 2009; Sheridan et al., 2011) and that the effect may be

determined by participants' characteristics (Batterham et al., 2016; Baumeister et al., 2014). A brief video-based AFI focusing on reducing other attitudinal barriers, including low perceived effectiveness, perceived stigma, perceived ease of use and access to the intervention, for example, was found to be effective in increasing intention to use psychological interventions in case of future emotional problems in individuals already experiencing depressive symptoms (Baumeister et al., 2014, 2015; Ebert et al., 2015) but was proved to be ineffective in those not experiencing symptoms at the moment (Baumeister et al., 2014).

Despite being statistically significant, the magnitude of the effects found in this study was small. Potential reasons for the low effects might include it is generally not possible to increase the willingness to use mental health services over a certain extent, or only in very specific subgroups and in others, not. It might also be the case that not all students read the provided text, which was offered in a PDF to download. There was no technical way to control whether this was done. If this should be the case, the presented results might be an underestimation of the true effect. It is also noteworthy that the AFI was provided after an intense assessment of mental health and risk factors resulting possibly in some overload, which would be expected to reduce focus on the additional material. It is possible that the effects might be different if the AFI was combined with an assessment of only those questions relevant for the feedback. An alternative explanation for the low effects could be the insufficient tailoring to relevant characteristics given that it is likely that not all individuals respond to the same motivational strategy. Reviews indicate, for example, that men and women have specific barriers for the uptake of preventive interventions as well as different preferences concerning the foci of intervention approaches (Addis & Mahalik, 2003; Seidler, Dawes, Rice, Oliffe, & Dhillon, 2016; Spendelov, 2015a, 2015b; Yousaf, Grunfeld, & Hunter, 2015). Motivation psychology also indicates a distinction between individuals with a promotion-oriented ("promoters") or a prevention-oriented ("preventers") regulatory focus (Crowe & Higgins, 1997). Although "promoters" are considered to be motivated by advancement and accomplishment (e.g., they go running to feel good; Latimer et al., 2008; Spiegel, Grant-Pillow, & Higgins, 2004), "preventers" are considered to be motivated by security needs to avoid adverse outcomes (e.g., they go running to avoid illness). Therefore, it might be beneficial for AFIs to consider such disparate health-related motives as well as other potential relevant tailoring factors such as gender, cultural background, and treatment history. This is supported by metaanalytic findings showing that tailoring can increase the effects of printed health behavior change interventions, although the effects of tailoring are moderated by type of health behavior (Noar, Benac, & Harris, 2007). Moreover, because the AFI

is automated, scalable, and easy to implement, it could be assumed that such an approach may nevertheless be a low-cost method of having a meaningful impact at the population level.

In summary, the present findings indicate that a “one size fits all” is unlikely to be effective for everyone and that future approaches should target to important individual characteristics. This assumption is supported by the moderator analyses indicating that some students experience larger effects than others as well as findings that show that treatment utilization (Bruffaerts et al., this issue) and the intention to seek help in case of future emotional problems is associated with a range of factors, such as the preference to solve problems alone, feeling too embarrassed, and fulfilling the criteria for 12-month MDD (Ebert et al., this issue). Subsequent analyses of the current data are needed to refine the preliminary moderator analysis to investigate the possible existence of complex interactions and to adjust for the likelihood of overfitting in our current exploratory analysis. The comparatively large sample size based on the experiment being embedded in a survey of all entering students is a great advantage in this regard in that complex moderator analyses to search for multivariate profiles associated with high intervention response require large samples (Luedtke, Sadikova, & Kessler, in press).

In addition, an expanded series of future cross-national WMH-ICS experiments are needed to examine more sophisticated AFI versions that tailor the intervention to participant characteristics that might plausibly be expected to influence intervention effects. These interventions might also take into consideration service-related characteristics and include more interactive elements such as videos. It is also certain that the development of such individually-tailored AFIs will require an iterative series of successive experiment that will take a number of years to perfect, making the ongoing WMH-ICS initiative a perfect context in which to implement this program of research.

Results of the current study should be seen in the light of a range of limitations. First, the implementation of the study following an intensive questionnaire (up to 150 items) needed for other research purposes within the WMH-ICS initiative contributed to a high dropout rate before entering the study. Moreover, the initial WMH-ICS screener to which the students were invited was labeled as research, and the direct benefit for each student remained unclear. This might have led to selection bias, and therefore generalizability might be limited. Future studies should, therefore, investigate the reach and effectiveness of the investigated AFI when delivered solely with the items necessary for providing personal risk feedback and potential benefits for the students are clearly stated. Second, we only focused on intention to use mental health services instead of actual use. Although intention is the best available proxy for actual use (Eccles et al., 2006), it cannot directly be translated to actual utilization, and the so-called “intention-behavior gap” is widely known (Snihotta, Scholz, & Schwarzer, 2005). Given the small effect size in the overall analysis, it is at least questionable whether the current AFI lead to an actual increase in mental health service utilization. As noted above, we plan to address both of these limitation in future WMH-ICS analyses that focus on longitudinal associations and attempt to influence actual help-seeking rather than hypothetical help-seeking. Third, we conducted a large number of statistical tests in the moderator analyses. It may be the case that some of the significant findings occurred

due to chance and future studies along the lines noted above are needed to confirm these results. Fourth, although a broad range of moderators was examined, the study was underpowered to explore moderators with small subsamples and low effect sizes. Limitations of sample size also resulted in the inability to examine multivariate profiles of moderators or potentially complex interactions among moderators. As noted above, we plan to address this problem in a future cross-national expansion of AFI interventions in WMH-ICS that investigate the possibility that different barriers are relevant for different students with disorders, different motivation statuses, different experience levels, different study situations, and more. The investigation of these possibilities will require more complex and contemporary study designs such as the multiphase optimization strategy (Collins, 2018) or sequential multiple assignment randomized trials (Collins, Murphy, & Strecher, 2007). In such designs, it is possible to determine the incremental value of specific intervention components and tailoring strategies. This can be done by example a series of fractional factorial designs, instead of only evaluating the average effect of packages of different intervention components as it is often being done in psychological outcome research. Building such studies on multinational collaborations such as the WMH-ICS initiative that conducts similar studies across multiple countries allows researchers to achieve large enough sample sizes that are needed to realize complex evaluation designs.

Implications of the present study include that screening of mental health symptoms and providing feedback about symptom severity, psychoeducation on relevant symptoms, and information about available potentially effective treatment is not sufficient for many students. Effects of the AFI differ widely between students; and although some one-way moderators such as 12-month and lifetime prevalence of panic disorder, physical health, and sexual orientation could be identified, it is likely that more complex relationships affect the mechanism of action of acceptance facilitating interventions. Much more research is needed to better understand how individuals at risk for mental health disorders can be motivated to participate in mental health interventions.

ACKNOWLEDGMENTS

Funding to support this initiative was received from the National Institute of Mental Health (NIMH) R56MH109566 (R. P. A.), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Mental Health or NIMH; the Belgian Fund for Scientific Research (11N0514N/11N0516N/1114717N) (P. M.), the King Baudouin Foundation (2014-J2140150-102905; R. B.), and Eli Lilly (IIT-H6U-BX-I002; R. B., P. M.); BARMER, a health care insurance company, for project StudiCare (D. D. E.); ZonMw (Netherlands Organisation for Health Research and Development; grant number 636110005) and the PFGV (PFGV; Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (P. C.); South African Medical Research Council and the Ithemba Foundation (D. J. S.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III - FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440), Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya

(2017 SGR 452), FPU (FPU15/05728; J. A.); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III-FEDER (PI13/00506; G. V.); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (T. B.); Consejo Nacional de Ciencia y Tecnología (CONACyT) grant CB-2016-01-285548 (C. B.). The WMH-ICS initiative is carried out as part of the WHO World Mental Health (WMH) Survey Initiative. The WMH survey is supported by the National Institute of Mental Health (NIMH) R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the United States Public Health Service (R13-MH066849, R01-MH069864, and R01-DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (RCK). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH publications can be found at <http://www.hcp.med.harvard.edu/wmh/>.

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FUNDING INFORMATION

The funding sources had no role in the design and conduct of the study; collection, management, analysis, interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

CONFLICTS OF INTEREST

Dr. Ebert reports to have received consultancy fees/served in the scientific advisory board from several companies such as Sanofi, Novartis, Minddistrict, Lantern, Schoen Kliniken, and German health insurance companies (BARMER, Techniker Krankenkasse). He is also stakeholder of the Institute for health training online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care.

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out health care research.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Ebert DD, Franke M, Kählke F, et al. Increasing intentions to use mental health services among university students. Results of a pilot randomized controlled trial within the World Health Organization's World Mental Health International College Student Initiative. *Int J Methods Psychiatr Res*. 2019;28:e1754. <https://doi.org/10.1002/mpr.1754>

Internet interventions for mental health in university students: A systematic review and meta-analysis

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Abstract

Objectives: Mental health disorders are highly prevalent among university students. Universities could be an optimal setting to provide evidence-based care through the Internet. As part of the World Mental Health International College Student initiative, this systematic review and meta-analysis synthesizes data on the efficacy of Internet-based interventions for university students' mental health.

Method: A systematic literature search of bibliographical databases (CENTRAL, MEDLINE, and PsycINFO) for randomized trials examining psychological interventions for the mental health (depression, anxiety, stress, sleep problems, and eating disorder symptoms), well-being, and functioning of university students was performed through April 30, 2018.

Results: Forty-eight studies were included. Twenty-three studies (48%) were rated to have low risk of bias. Small intervention effects were found on depression ($g = 0.18$, 95% confidence interval [CI; 0.08, 0.27]), anxiety ($g = 0.27$, 95% CI [0.13, 0.40]), and stress ($g = 0.20$, 95% CI [0.02, 0.38]). Moderate effects were found on eating disorder symptoms ($g = 0.52$, 95% CI [0.22–0.83]) and role functioning ($g = 0.41$, 95% CI [0.26, 0.56]). Effects on well-being were non-significant ($g = 0.15$, 95% CI [–0.20, 0.50]). Heterogeneity was moderate to substantial in many analyses. After adjusting for publication bias, effects on anxiety were not significant anymore.

Discussion: Internet interventions for university students' mental health can have significant small-to-moderate effects on a range of conditions. However, more research is needed to determine student subsets for which Internet-based interventions are most effective and to explore ways to increase treatment effectiveness.

KEYWORDS

college, Internet, mental disorders, meta-analysis, psychotherapy

1 | INTRODUCTION

The university years are a decisive developmental phase and mark the transition from late adolescence to emerging adulthood (Arnett, 2004). Although often conceptualized as a time of positive personal

development (Evans, Forney, Guido, Patton, & Renn, 2009), post-secondary education also represents a peak onset period for the occurrence of mental disorders (Ibrahim, Kelly, Adams, & Glazebrook, 2013). It is estimated that 12–46% of all university students are affected by mental health disorders in any given year (Auerbach

et al., 2016; Auerbach et al., 2018; Blanco et al., 2008; Eisenberg, Hunt, & Speer, 2013; Verger, Guagliardo, Gilbert, Rouillon, & Kovess-Masfety, 2009). Mental disorders account for about half of the disease burden of young adults in high-income countries (WHO, 2008) and are associated with long-standing negative outcomes for both the individual and society, including lowered academic achievement (Eisenberg, Golberstein, & Hunt, 2009; Hysenbegasi, Hass, & Rowland, 2005), college dropout (Ishii et al., 2018; Kessler, Foster, Saunders, & Stang, 1995), and worse functioning in later life (Goldman-Mellor et al., 2014; Niederkröthenthaler et al., 2014).

Despite the availability of effective treatment, research documents a substantial treatment gap in university students suffering from mental illness, with only one in five receiving minimally adequate treatment (Auerbach et al., 2016). The average duration of untreated mental disorders stretches between 4 to 23 years (Wang et al., 2005) and is associated with worse clinical outcomes (Ricky & O'Donnell Siobhan, 2017). Reaching students through early intervention is therefore of paramount importance.

In recent years, the potential of the Internet to facilitate help-seeking and address mental health issues in post-secondary education has become increasingly evident (Davies, Morriss, & Glazebrook, 2014; Ebert, Cuijpers, Muñoz, & Baumeister, 2017). Contents can be easily and anonymously accessed through the Internet, and Internet-delivered programs provide high cost-effectiveness and scalability (Ebert et al., 2018). In 2011, the United Kingdom's Royal College of Psychiatrists recommended to increase the availability of evidence-based Internet interventions among university students (Royal College of Psychiatrists, 2011).

Two previous meta-analyses have synthesized the effects of technology and computer-delivered interventions on university students' mental health. Davies, Morriss, and Glazebrook (2014) included 14 studies, primarily evaluating Internet-based cognitive behavioural therapy (CBT; 93%), and found moderate to large effects on depression, anxiety, and stress (standardized mean difference [SMD] = 0.43–0.73) compared with inactive control groups but no superiority of these interventions compared with active controls. Conley, Durlak, Shapiro, Kirsch, and Zahniser (2016) conducted a systematic search in 2014 targeting preventive interventions, but included somewhat outdated technology (e.g., VCR and audiotape player), and reported effects from SMD = 0.20–0.34 on depression, anxiety, and stress outcomes in non-clinical student samples compared with control groups. A systematic review on Internet-based eating disorder prevention was published in 2008 (Yager & O'Dea, 2008), with no meta-analysis performed. Given the rapid pace in technological development and the proliferation of Internet-based treatments in the last years, more updated, comprehensive knowledge on the effects of Internet-based approaches to address common mental health disorders in university students is needed. There is also a lack of synthesized information on the impact of Internet interventions on the academic functioning of students.

This systematic review aims to assess existing evidence regarding the effectiveness of Internet interventions on symptoms of common mental health disorders, well-being, and functioning outcomes among university students when compared with control groups.

2 | METHODS

This study was carried out as part of the WHO World Mental Health International College Student (WMH-ICS) initiative (WMH-ICS, 2018). The WMH-ICS aims to obtain accurate cross-national information on the prevalence, incidence, and correlates of mental, substance, and behavioural problems among college students worldwide; to describe patterns of service use, barriers to treatment, and unmet need for treatment; to investigate the associations of these disorders with role function in academic and other life domains; to evaluate the effects of a wide range of preventive and clinical interventions on student mental health, functioning, and academic performance; and to develop precision medicine clinical decision support tools to help select the right interventions for the right students (see Cuijpers et al., 2018). The WMH-ICS's meta-analysis initiative and this specific study have both been registered with PROSPERO (CRD42017068758; CRD42018090259). The procedures and results of this systematic review are outlined in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009).

2.1 | Eligibility criteria

We included (a) randomized controlled trials (RCTs) in which (b) participants were enrolled at a tertiary education facility (university, college, or comparable post-secondary higher education) at the time of randomization and (c) had self-selected themselves to participate in the trial. Studies had to compare (d) a psychological intervention delivered via the Internet to (e) a control condition (wait list, no treatment, psychoeducation, and placebo) in terms of effects on (f) symptoms of common mental health problems (depression, anxiety, (di)stress, sleep problems, and disordered eating) or well-being as a (g) target outcome of the study using (h) standardized symptom measures.

Only studies (a) published in English or German were considered for inclusion. We included studies (b) published in peer-review journals, dissertations that were indexed in bibliographical databases, and unpublished full manuscripts.

Interventions were defined as eligible when the Internet was used as delivery mode, irrespective of the platform or device used (computer, tablet, mobile, and app). Technology-supported interventions with no involvement of the Internet were excluded. We defined a study's outcome as its target condition when (a) it was declared the primary outcome of the study, or (b) the article stated that the intervention was primarily aimed at this outcome (e.g., "the intervention aimed to reduce depression and anxiety" and "the program was designed to help students deal with academic stress"). When two or more articles were found to report analyses of the same study sample, only the one reporting the primary analysis of an outcome of interest was included. Studies reporting secondary analyses and studies published after the primary analysis was published were excluded. We only focused on studies in which participants actively decided to participate in the intervention (e.g., by responding to a recruitment e-mail or on-campus advertisements). We believe this best reflects the

routine practices of many universities, at which interventions are offered to all students interested to use them.

2.2 | Search strategy

Publications were identified by searching three major electronic databases, the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, and PsycINFO on April 27, 2017. There were no restrictions on publication date or status. The search was based on a string combining terms (text words, MeSH terms, and subject headings) indicative of psychological interventions in tertiary education settings and included filters for RCTs (see Table S1). The string did not contain terms restricting the search to disorders or delivery modes targeted in this analysis, thus accepting a high number of references to screen but minimizing the risk of missing relevant studies. In a second step, references in identified studies and previous systematic reviews of overlapping topics were checked for earlier publications. To identify grey literature, the WHO international clinical trials registry platform was searched for unpublished trials. Authors of study protocols without published results were contacted to determine the eligibility of potentially unpublished data. The initial search was updated on April 30, 2018.

2.3 | Study selection

Study selection began with titles and abstracts of all articles being screened for overall fit for this analysis. We then retrieved and independently assessed full texts of all selected articles for eligibility. Both steps were performed independently by two researchers (M. H. and S. A.) supervised by a senior researcher (D. E.). Discussion between researchers was initiated in case of assessor disagreement; two senior researchers (D. E. and H. B.) were consulted when disagreement could not be resolved.

2.4 | Data extraction and classification

The following data were extracted for each article if reported or applicable: (a) bibliographical data (first author and year of publication); (b) study design features (sample size, study flow, recruitment method, cut-offs for inclusion, type of control group, primary outcome/target condition and functioning outcomes, time and point of assessments, duration of the intervention, name of the intervention, and compensation) and sample characteristics (mean age, gender, and studies majors); (c) therapeutic content of the intervention(s); (d) setting (country and type of tertiary education facility); (e) treatment modality (e.g., discussion forum, website, app, or e-mail); (f) type of human guidance (intervention reminders, individual feedback, or unguided); (g) study dropout rate and missing data handling; (h) intervention attrition rates; and (i) data needed to calculate effect sizes. Functioning outcomes were defined as measures assessing either the (a) academic productivity or the (b) social/work impairment due to mental health problems of students. When relevant information could not be extracted, corresponding authors were contacted a maximum of two times to attain or clarify information. When the authors did not

respond, and information given in the article was insufficient to perform meta-analysis, the article was excluded.

Extracted data were used to classify studies into pre-specified categories for subgroup analyses. A comprehensive list of all categories along with their coding criteria can be found in Table S2.

2.5 | Quality assessment

The validity of included studies was evaluated by two researchers (M. H. and S. A.). Assessment followed the approach described by Furlan, Pennick, Bombardier, and van Tulder (2009), using the domains of the "Risk of Bias" assessment tool in RCTs developed by the Cochrane collaboration (Higgins & Green, 2011). There were 12 criteria: (a) random sequence generation; (b) allocation concealment; blinding of (c) participants, (d) personnel, or (e) outcome assessors; (f) dropout rate and (g) intention-to-treat analysis (incomplete outcome data); (h) selective outcome reporting; and other threats to validity: (i) similar groups at baseline, (j) no or similar co-interventions between intervention and control groups, (k) compliance, and (l) identical timing for outcome assessment. Typically, blinding of patients and treatment providers is difficult to achieve and maintain for non-pharmacological interventions (Boutron et al., 2007), resulting in a high risk of bias on this domain. Studies were rated as showing either "low," "high," or "unclear" risk of bias on each of these criteria. If at least six criteria were rated as "low" in one study, and if no serious flaw was detected, a study was declared to show an overall low risk of bias.

2.6 | Meta-analytic procedure

Data analysis was performed using the *meta* (Schwarzer, Carpenter, & Rücker, 2015) and *metafor* (Viechtbauer, 2010) packages in R version 3.4.3 (R Core Team, 2017). For each included study, between-group effect sizes between intervention and control groups at post-treatment were calculated. We recoded the calculated effect size when higher scores of an outcome indicated better results (e.g., well-being and academic productivity). This was done to ensure that positive effect sizes always mean that the results favour the intervention group. As many included studies had small sample sizes, we calculated Hedges' *g* as an effect size because this adjusts for small sample bias (Hedges & Olkin, 2014). The SMD (Hedges' *g*) being difficult to interpret from a clinical standpoint, we also report pooled effect sizes transformed into the numbers-needed-to-treat (NNT) or the numbers-needed-to-harm (NNH), respectively. NNTs indicate the number of patients to be treated to generate one additional positive outcome compared with no treatment. NNHs are used for negative effects to indicate the number of individuals to be treated to generate one additional negative outcome. NNTs/NNHs were calculated using the formulae by Kraemer and Kupfer (2006):

$$\text{NNT} = \frac{1}{2 \times \Phi\left(\frac{\text{SMD}}{\sqrt{2}}\right) - 1}$$

As we anticipated considerable heterogeneity among studies, we applied a random-effects pooling model using the Hartung-Knapp-

Sidik–Jonkman method (IntHout, Ioannidis, & Borm, 2014; Sidik & Jonkman, 2002) in all analyses. Prediction intervals (95%) were calculated around the pooled effect sizes, indicating the range in which the true effects of a similar future trial are expected to fall based on present evidence (Borenstein, Higgins, Hedges, & Rothstein, 2017). A significance level of $\alpha = 0.05$ (two-sided) was used for all analyses. Effect sizes were interpreted according to Cohen (1988). Using this convention, an effect size of 0.2 can be considered a small effect, 0.5 a moderate effect, and 0.8 a large effect. Heterogeneity was evaluated using the I^2 statistic (Higgins & Thompson, 2002). I^2 heterogeneity of 25% can be regarded as low, 50% as moderate, and 75% as substantial heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

2.7 | Analyses

2.7.1 | Main analyses

Studies with the same primary/target outcome were pooled to generate a mean effect size for each outcome. If a study reported more than one target outcome of interest, it was included in all analyses for which it provided fitting outcomes. For the analysis of functioning outcomes, we pooled all available outcome data, irrespective of having been declared a target or secondary outcome in eligible studies. Target outcomes for which less than four studies were available were not synthesized.

Some sensitivity analyses were performed. When considerable heterogeneity ($I^2 \geq 50\%$) was present in an analysis, analyses without statistical outliers were conducted. Outliers were controlled for by removing studies when their 95% confidence interval (CI) lay entirely outside the one of the pooled effect size. For all outcomes, influence analyses, also referred to as “leave-one-out” analyses (i.e., omitting one study at a time when calculating the pooled effect size; Viechtbauer & Cheung, 2010), were performed to evaluate the influence of individual studies on the overall effect. The outlying study1000 exerting the greatest influence on the overall results was then removed. For some analyses, studies with several intervention arms were included, resulting in two or more interventions being compared with the same control condition. Such comparisons are not independent, which may distort pooled effect sizes by artificially reducing heterogeneity (Borenstein, Hedges, Higgins, & Rothstein, 2009). As a sensitivity analysis, we therefore recalculated results including only one effect size per study, starting with the comparison with the smallest effect size and then the one with the largest effect size. In another approach, we combined the effects of all intervention groups in one study to create a single comparison and then recalculated the results (Higgins & Green, 2011). Lastly, we estimated the average effect using only the studies with low risk of bias.

Two approaches were used to evaluate publication bias. First, we inspected contour-enhanced funnel plots (Peters, Sutton, Jones, Abrams, & Rushton, 2008) and performed Egger's test of the intercept (Egger, Smith, Schneider, & Minder, 1997) to assess funnel plot asymmetry. When we found indications of publication bias, we used the Duval and Tweedie trim and fill procedure (Duval & Tweedie, 2000) to adjust for possible bias. These methods assume that publication

bias primarily operates through effect size. It has been argued that this assumption may not be true (Simonsohn, Nelson, & Simmons, 2014a) and that in the social sciences, publication bias is often driven by statistical significance instead (p levels; Fanelli, 2012).

We therefore additionally used p curve, a novel method to detect selective reporting bias in meta-analysis (Simonsohn et al., 2014a), which assumes that bias is caused because only statistically significant results ($p < 0.05$) are considered for publication. A p curve was attained by plotting the percentage of exact p values of all significant effects ($p < 0.05$) in an analysis. A significant test of right-skewness of the p curve indicates the presence of evidential value in an analysis. R syntax provided by Simonsohn, Nelson, and Simmons (2018; <http://www.p-curve.com>) was used to conduct the p curve analysis. To estimate the adjusted true average effect, R syntax by Simonsohn, Nelson, and Simmons (2014b) was used. It has been shown that p curve leads to accurate effect size estimates in the presence of publication bias and outperforms the trim and fill procedure (Simonsohn et al., 2014b). However, a lack of robustness has been noted for analyses with substantial heterogeneity (van Aert, Wicherts, & van Assen, 2016). Following the recommendations by van Aert, Wicherts, and van Assen (2016), we only report the adjusted effect size estimate for analyses with $I^2 < 50\%$.

These two approaches are based on different assumptions on the origin of publication bias. As it cannot be ultimately decided which assumption better reflects the field of this meta-analysis, and as both methods have evident shortcomings, we report both here.

2.7.2 | Subgroup analyses

To examine possible sources of heterogeneity, subgroup analyses were conducted for outcomes with enough studies available ($k > 10$; depression, anxiety, and stress). Subgroup analyses were performed for treatment technique (CBT interventions, interventions training one particular mental health-related skill, or other interventions), sample type (unselected, preselected through risk factors, standardized symptom cut-offs, or clinical diagnostic interview), control group (active or passive), study compensation (yes or no), type of guidance (unguided, reminders, or feedback), risk of bias rating (high or low), convenience sample rating (yes or no), and recruitment type (i.e., on campus, subject pool, online, or mixed).

3 | RESULTS

The database search yielded 44,839 records. A total of 90 studies remained for full-text analysis after duplicate removal and exclusion based on title and abstract. Forty-eight studies, with 54 comparisons between intervention and control groups, fulfilled all eligibility criteria and were included. After contacting authors of published trial protocols, we were provided with one manuscript not yet published at the time (Noone & Hogan, 2016), which was included. The study selection process and reasons for exclusion are depicted in Figure 1. References for the included studies are given in Table S3.

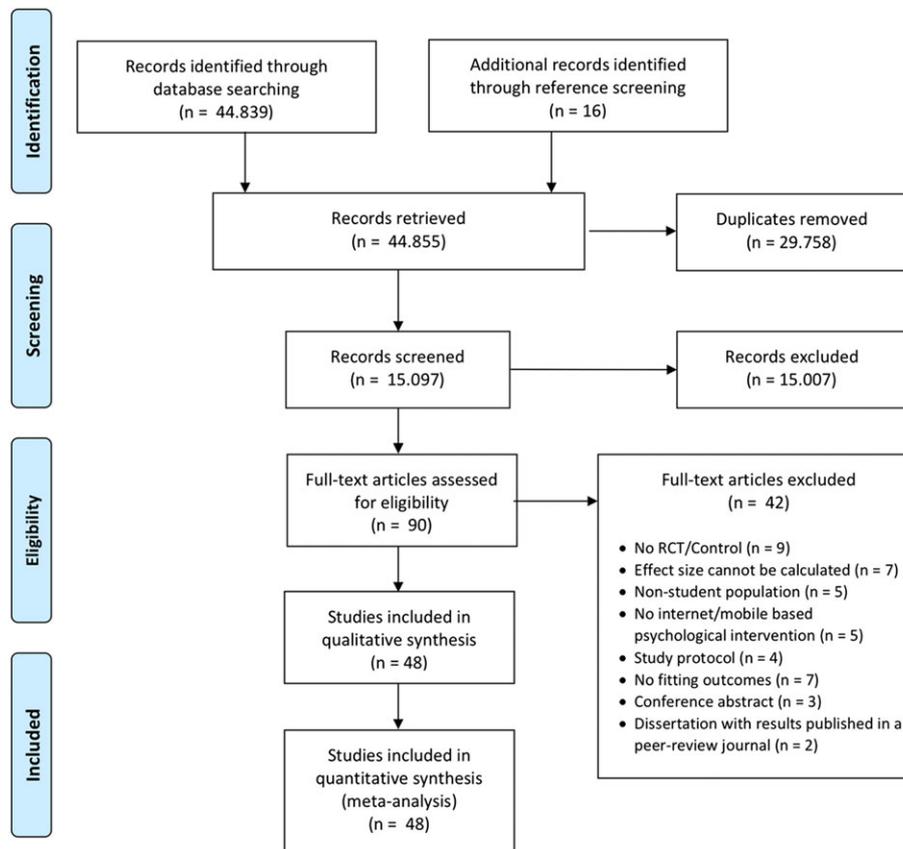


FIGURE 1 PRISMA flowchart

3.1 | Study characteristics

Detailed study characteristics can be found in Table 1. In sum, 10,583 participants were included in the trials. Sample sizes ranged from $N = 38$ to 2,638. The mean age ranged from 18.37 to 29. Seventy-four per cent ($n = 7,831$) of all participants were female. A total of 25 studies (52.08%; 27 comparisons) were conducted in general university samples in which no preselection of participants based on symptom measure or risk factors was performed. Eighteen studies (37.5%; 22 comparisons) were conducted in samples preselected through standardized cut-offs or risk factors. Only five (10.42%; five comparisons) were conducted in confirmed clinical samples.

Depression was the target or primary outcome of 26 studies, followed by anxiety ($k = 24$), stress ($k = 16$), disordered eating ($k = 9$), well-being ($k = 4$), and sleep ($k = 2$). Student functioning outcomes (e.g., work productivity and clinical impairment) were assessed in nine studies.

In 37 (77.08%) trials, an intervention was compared with a passive control group (42 comparisons), whereas 11 (22.92%) used active control conditions (12 comparisons). Among passive controlled studies, most employed wait lists ($k = 27$, 56.25%), followed by no intervention controls ($k = 6$, 12.5%) and provision of psychoeducational material without instructions for behaviour change ($k = 4$, 8.33%). Sham placebos, diaries, or recommendations for behaviour change were used as active control conditions.

Of the 53 intervention programs, 24 (45.28%) were fully unguided, nine (16.98%) included reminder mechanisms only, and 20 (37.74%) were guided interventions in which human feedback was

given to participants. Thirty-five interventions (66.04%) were CBT programs, of which 10 (18.86%) were based on third-wave CBT techniques. Eleven interventions (20.75%) were skill trainings focusing on one specific mental health-related skill (e.g., relationship or acculturation skills). Other interventions used emotional disclosure (two interventions; 3.77%; e.g., peer support and discussion groups), personalized symptom and coping-related feedback (two interventions; 3.77%), or bias modification procedures (two interventions; 3.77%) as their main therapeutic strategy.

In 43 studies (89.58%), interventions were delivered through a website. In three studies (6.25%), intervention content was provided via e-mail. Mobile-based components were used in five studies (10.42%), of which three (6.25%) employed mobile apps.

3.2 | Risk of bias

In total, 23 articles (47.92%) received a low risk of bias rating on ≥ 6 criteria. These were coded as studies of higher quality. The overall quality was suboptimal for some of the included RCTs. Five studies (10.42%) met ≤ 3 criteria, and no study met all analysed criteria. Figure 2 presents overall percentages of studies with high, low, or unclear risk of bias on each of the criteria.

3.3 | Main analyses

The pooled effects for each outcome and sensitivity analysis are summarized in Table 2. Forest plots for all outcome analyses are presented

TABLE 1 Study characteristics

Study	Type	Recruitment	Student sample	Inclusion criterion	Target condition (instrument)	Functioning outcome	Conditions	n	Technique	Age (M)	Female (%)	Guidance	FU, weeks	Dropout (post; %)	ITT	Country
Botella et al. (2010)	Cli	Campus	General	Social phobia diagnosis	Social anxiety (SAD)	Social and work impairment (MS)	1. ICBT (<i>Talk to Me</i>) 2. Face-to-Face CBT 3. Wait list	62 36 29	CBT	24.4	79.20	n.s. (no)	8	39.37	Yes	ESP
Cavanagh et al. (2013)	Gen	Online	General	—	Anxiety/depression (PHQ-4), stress (PSS)	—	1. Mindfulness-based intervention 2. Wait list	54 50	3rd wave CBT	24.7	88.50	No	2	44.23	Yes	UK
Cello et al. (2000)	Gen	Campus	Undergraduate	—	Eating disorder symptoms (EDE-Q weight/shape concerns)	—	1. Eating disorder prevention (StudentBodies) 2. Classroom eating disorder program (<i>BodyTraps</i>) 3. Wait list	27 25 24	CBT	19.6	100	Discussion group, feedback	8, 24	11.84	Yes	USA
Day et al. (2013)	Sel	Online	General	DASS ≥ 15 , 10, 18	Depression, anxiety, stress (DASS)	—	1. ICBT 2. Wait list	33 33	CBT	23.55	89.30	Feedback	6, 24	19.75	Yes	CAN
Ellis et al. (2011)	Gen	n.s.	Psychology	—	Depression, anxiety (DASS)	—	1. ICBT (<i>Moodgym</i>) 2. Peer support (<i>Moodgarden</i>) 3. No treatment	13 13 13	CBT	19.67	77.00	No	3	n.s.	n.s.	AUS
Frazier et al. (2014)	Gen	n.s.	Psychology	—	Stress (DASS)	—	1. Present Control Intervention 2. Psychoeducation	92 82	Skills training	n.s.	75.00	No	2, 5	18.68	Yes	USA
Freeman et al. (2017)	Cli	Online	General	SCI ≤ 16	Insomnia (SCI-8)	Social and work impairment (WSAS)	1. ICBT (<i>Sleepio</i>) 2. Wait list	1152 1486	CBT	24.7	71.50	Discussion group	10, 22	50.10	Yes	UK
Freeman (2008)	Gen	Online	General	—	Well-being (CORE-OM)	—	1. Peer support 2. Psychoeducation	51 82	Emotional disclosure	n.s.	70.00	No	10	44.12	No	UK
Gaffney (2013)	Gen	Subject pool	General	—	"Distress": depression, anxiety, stress (DASS)	—	1. Problem-solving simulator (MYLO) 2. Placebo therapist simulator (<i>Eliza</i>)	22 20	Skills training	21.4	78.57	No	2	12.50	No	UK
Geisner (2006)	Sel	Subject pool	Psychology	BDI ≥ 14	Depression (BDI)	—	1. Personalized feedback and coping strategies 2. Wait list	89 88	Personalized feedback	19.28	70.00	No	4	5.65	n.s.	USA
Geisner (2015)	Sel	Subject pool	Psychology	BDI ≥ 14 AUDIT ≥ 8	Depression (BDI)	—	1. Personalized feedback and coping strategies (depression) 2. PF and coping strategies (depression and alcohol) 3. Wait list	85 85 85	Personalized feedback	20.14	62.40	No	4	8.30	Yes	USA
Gibbel (2010)	Sel	n.s.	Psychology	CES-D ≥ 10 , <25	Depression (CES-D)	—	1. Spiritual intervention 2. ICBT (<i>Moodgym</i>) 3. No treatment	24 19 22	1. 3rd wave 2. CBT	20.45	83.00	Reminder	5, 7	27.70	No	USA
Greer (2015)	Gen	n.s.	Psychology	—	Depression, anxiety, stress (DASS)	—	1. Present control + mindfulness int. 2. Mindfulness intervention 3. Stress self-help readings	121 122 122	1. Skills training 2. 3rd wave	n.s.	75.00	Feedback	4, 12	6.51	Yes	USA
Harrer (2018)	Sel	Online	General	PSS-4 ≥ 8	Stress (PSS)	Academic impairment (PS-5)	1. ICBT for stress (<i>StudiCare</i>) 2. Wait list	75 75	CBT	24.1	74.70	Feedback	7, 12	7.35	Yes	GER

(Continues)

TABLE 1 (Continued)

Study	Type	Recruitment	Student sample	Inclusion criterion	Target condition (instrument)	Functioning outcome	Conditions	n	Technique	Age (M)	Female (%)	Guidance	FU, weeks	Dropout (post; %)	ITT	Country
Hintz (2015)	Sel	n.s.	Psychology	PCOSES ≤ 3	Depression, anxiety, stress (DASS)	—	1. Present control intervention 2. Present control + feedback 3. Psychoeducation	97	Skills training	n.s.	70.00	Feedback (2. only)	4, 12	6.51	Yes	USA
Hoppitt (2014)	Gen	Online	Undergraduate	—	Anxiety (STAI)	—	1. Cognitive bias modification 2. Placebo	35	CBM	n.s.	79.71	No	2, 4	8	n.s.	UK
Jacobi (2007)	Gen	Mixed	General	—	Eating disorder symptoms (EDE-Q weight concerns)	—	1. Eating disorder prevention (StudentBodies) 2. Wait list	47	CBT	22.3	100	No	8, 12	3	No	GER
Kanekar (2009)	Gen	n.s.	Asian students	—	Distress (K-10)	—	1. Acculturation intervention 2. Wellness information and strategies	30	Skills training	24.6	12.80	No	8	35	No	USA
Kattelmann (2014)	Gen	Campus	Undergraduate	—	Stress (PSS)	—	1. Eating and stress management (YEAH) 2. Wait list	618	Skills training	19.3	67	No	12, 60	24.28	No	USA
Kenardy (2003)	Sel	n.s.	Psychology	ASI ≥ 21	Anxiety (ASI)	—	1. ICBT 2. Wait list	36	CBT	19.92	68.40	No	6, 24	10.84	n.s.	AUS
Kvillemo (2016)	Gen	Campus	General	—	Depression (CES-D), Well-being (PWB)	—	1. Mindfulness-based intervention 2. Expressive writing	40	3rd wave	29	75	No	8	15.56	Yes	SWE
Lee (2018)	Gen	Campus	General	—	Stress (PSS-10), Anxiety (STAI), Depression (QIDS-SR)	Work productivity (WPAI)	1. Mindfulness app (DeStressify) 2. Wait list	86	3rd wave	20.62	63	No	4	22.18	No	CAN
Levin (2014)	Gen	Campus	Undergraduate	—	"Distress": depression, anxiety, stress (DASS)	—	1. ACT-based intervention (ACT on college life) 2. Wait list	37	3rd wave	18.37	53.90	Reminder	3, 6	3.95	Yes	USA
Levin (2016)	Gen	Subject pool	Undergraduate	—	n.s., depression, anxiety, stress (DASS)	—	1. ACT-based intervention (ACT on college life) 2. Mental health education website	114	3rd wave	21.61	76.90	Reminder	3, 12	22	Yes	USA
Levin (2017)	Gen	Subject pool	Undergraduate	—	n.s., depression, anxiety (CCAPS)	—	1. ACT-based intervention (ACT on college life) 2. Wait list	40	3rd wave	20.51	66	Reminder	4	19	Yes	USA
Lintvedt (2011)	Sel	Online	General	K-10 ≥ 20	Depression (CES-D)	—	1. ICBT (Moodgym) + psychoeducation (BluePages) 2. Wait list	81	CBT	28.7	76.60	No	8	37.40	Yes	NOR
Mailey (2010)	Cli	Campus	General	Mental health disorder, n.s.	Depression (BDI), anxiety (STAI)	—	1. Physical activity intervention (IPAC5) + TAU 2. TAU	24	Skills training	25	68.10	Feedback	10	8.51	No	USA
McCall (2018)	Sel	Subject pool	General/psychology	Mini-SPIN, DSM criteria (≥ 1)	Social anxiety (SIAS)	—	1. Web-based CBT (Overcome social anxiety) 2. Wait list	51	CBT	21.86	72	Reminder	16	35.64	Yes	CAN
Melnyk (2015)	Gen	Campus	General	—	Depression (PHQ-9), anxiety (GAD-7)	Grade point average	1. ICBT skills training (COPE) 2. No treatment	61	CBT	18.67	86.40	No	7, 10	23.14	No	USA

(Continues)

TABLE 1 (Continued)

Study	Type	Recruitment	Student sample	Inclusion criterion	Target condition (instrument)	Functioning outcome	Conditions	n	Technique	Age (M)	Female (%)	Guidance	FU, weeks	Dropout (post; %)	ITT	Country
Mogase (2013)	Sel	Online	Undergraduate	BDI \geq 12	Depression (BDI)	—	1. Cognitive bias modification 2. Wait list	20	CBM	22.87	95.24	No	1	2.30	No	ROM
Morris (2015)	Gen	Online	General	—	Anxiety (STAI), insomnia (PSQI)	—	1. iCBT for anxiety 2. iCBT for insomnia 3. Wait list	43 48 47	CBT CBT	20.5	67.39	Reminder	6	18.80	Yes	UK
Mullin (2015)	Sel	Mixed	General	Depression, anxiety symptoms (self-identified)	Depression (PHQ-9), anxiety (GAD-7)	Mental health-related disability (SDS)	1. iCBT (UniWell-being Course) 2. Wait list	30 24	CBT	27.86	61.81	Feedback	6, 12	19.50	Yes	AUS
Musiat (2014)	Gen	Online	General	—	Depression (PHQ-9), anxiety (GAD-7)	—	1. Trait-focused iCBT 2. Psychoeducation	519 528	CBT	n.s.	70.50	No	6, 12	50.33	n.s.	UK
Nguyen-Feng (2015)	Gen, Sel	Campus	Psychology	IPV history	"Distress": depression, stress (DASS)	—	1. Present control intervention 2. Wait list	329 171	Skills training	n.s.	62	No	6	14	Yes	USA
Noone (2018)	Gen	n.s.	Psychology	—	Well-being (WEMWBS)	—	1. Meditation app (Headspace) 2. Sham meditation placebo	43 48	3rd wave	20.92	75.82	Reminder	6	22	Yes	IRL
Orbach (2007)	Gen	Online	General	—	Test anxiety (TAI)	—	1. iCBT 2. Placebo	30 28	CBT	23.67	72.55	F2F introduction	6	32.56	No	UK
Räsänen (2016)	Gen	Online	General	—	Anxiety, depression, stress (DASS), Well-being (MHC)	—	1. ACT-based intervention (Student compass) 2. Wait list	33 35	3rd wave	24.29	85.30	Feedback	7	6	Yes	FIN
Richards (2016)	Cli	Online	General	GAD-7 \geq 10	Anxiety (GAD-7)	Social amd work impairment (WASA)	1. iCBT (Calm anxiety) 2. Wait list	70 67	CBT	23.82	77.40	Feedback	6	18.25	Yes	IRL
Saekow (2015)	Sel	Mixed	General	WCS \geq 47	Eating disorder symptoms (EDE-Q)	Clinical impairment (CIA)	1. Eating disorder prevention (StudentBodies) 2. Wait list	31 34	CBT	23	100	Feedback	10	36.92	Yes	USA
Sánchez-Ortiz (2011)	Cli	Online	General	Bulimia, ED NOS diagnosis	Eating disorder symptoms (EDE)	—	1. iCBT (Overcome bulimia online) 2. Wait list	36 31	CBT	23.9	100	Feedback	12, 24	11.84	Yes	UK
Sarniak (2009)	Gen	Subject pool	Psychology	—	Depression (GES-D)	—	1. Expressive writing, positive events 2. No treatment	47 44	Emotional disclosure	19.6	77	Reminder	4	9	No	USA
Sethi (2010)	Sel	Campus	Undergraduate	DASS, "severe" level	Depression, anxiety (DASS)	—	1. iCBT (Moodgym) 2. Therapist-delivered CBT 3. Blended CBT 4. No treatment	9 10 9 10	CBT CBT CBT	19.74	65.79	Feedback	3	n.s.	n.s.	AUS
Stallman (2016)	Sel	Mixed	General	K-10 \geq 16	Depression, anxiety, stress (DASS)	—	1. Low-intensity iCBT (referral to Moodgym, VirtualClinic, TheDesk, AnxietyOnline) 2. Personalized feedback	52 55	CBT	23	92	Feedback	8, 24, 48	18.69	Yes	AUS
Stice 2012 (2014)	Sel	Mixed	General	Body image concerns (interview)	Eating disorder symptoms (eating disorder interview based on DSM)	—	1. Dissonance online intervention (eBody) 2. Dissonance group intervention 3. Brochure with body image tips	19 39 20	CBT CBT	21.6	100	No	6, 52, 104	1.90	Yes	USA

(Continues)

TABLE 1 (Continued)

Study	Type	Recruitment	Student sample	Inclusion criterion	Target condition (instrument)	Functioning outcome	Conditions	n	Technique	Age (M)	Female (%)	Guidance	FU, weeks	Dropout (post; %)	ITT	Country
Taylor (2016)	Sel	Mixed	General	WCS \geq 47	Eating disorder symptoms (EDE-Q)	Clinical impairment (CIA)	1. Eating disorder prevention (image and Mood) 2. Wait list	106	CBT	20	100	Feedback, discussion group	12.52, 104	9.70	Yes	USA
Taylor (2006)	Sel	Mixed	General	WCS \geq 50	Eating disorder symptoms (EDE-Q)	—	1. Eating disorder prevention (StudentBodies) 2. Wait list	206	CBT	20.8	100	Feedback, discussion group	8, 52	12.29	Yes	USA
Winzelberg (2000)	Gen	Campus	General	—	Eating disorder symptoms (EDE-Q weight concerns)	—	1. Eating disorder prevention (StudentBodies) 2. Control, n.s.	24	CBT	20	100	Feedback, discussion group	8, 12	13.30	Yes	USA
Zabinski (2001)	Sel	Campus	Psychology	BSQ \geq 110	Eating Disorder symptoms (EDE-Q)	—	1. Eating disorder prevention (StudentBodies) 2. Wait list	27	CBT	19.3	100	Feedback, discussion group	4, 10	7.35	Yes	USA

Note. AUS: Australia; CAN: Canada; CBM: cognitive bias modification; CBT: cognitive behavioural therapy; Cli: clinical sample; ESP: Spain; FIN: Finland; FU: follow-up; Gen: general sample; GER: Germany; iCBT: Internet-based cognitive behavioural therapy; IRL: Ireland; ITT: intention-to-treat analysis; n.s.: not specified; NED: Netherlands; NOR: Norway; ROM: Romania Sel: selected sample; SWE: Sweden; TAU: treatment as usual; UK: United Kingdom; USA: United States of America. ASI = Anxiety Sensitivity Index; BDI = Beck Depression Inventory; CCAPS = Counseling Center Assessment of Psychological Symptoms; SCI = Sleep Condition Indicator; CES-D = Center for Epidemiological Studies' Depression Scale; CIA = Clinical Impairment Assessment Questionnaire; CORE-OM = Clinical Outcomes in Routine Evaluation - Outcome Measure; DASS = Depression Anxiety Stress Scale; DSM = Diagnostic and Statistical Manual of Mental Disorders; ED NOS = Eating Disorder not otherwise specified; EDE = Eating Disorder Examination; EDE-Q = Eating Disorder Examination - Self Report Questionnaire; GAD-7 = Generalized Anxiety Disorder 7; IPV = Interpersonal Violence; PHQ-4 = Patient Health Questionnaire - 4 item version; PSS = Perceived Stress Scale; PS-S = Presenteeism Scale for Students; QIDS-SR = Quick Inventory of Depressive Symptomatology - Self Report; SAD = Social Avoidance and Distress Scale; STAI = Spielberger State-Trait Anxiety Inventory; WCS = Weight Concern Scale; WEMWBS = Warwick-Edinburgh Mental Well-being Scale; WPAL = Work Productivity and Activity Impairment questionnaire.

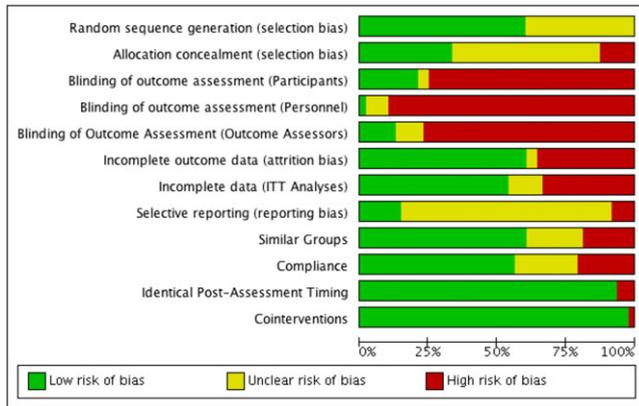


FIGURE 2 Risk of bias summary. ITT: intention-to-treat analysis

in Figures 3–8. Detailed results of the influence analyses are displayed in Figure S1. Funnel plots and *p* curves are presented in Figures S2 and S3. Detailed results on the publication bias analyses are reported in Tables S4 and S5.

3.3.1 | Depression

We could compare the effect of Internet interventions on symptoms of depression with control groups in 31 comparisons. The overall effect size was $g = 0.18$ (95% CI [0.08, 0.27]), which corresponds to an NNT of 9.80. Heterogeneity was moderate ($I^2 = 44\%$; 95% CI [15, 64]). The prediction interval ranged from $g = -0.26$ to 0.62. Similar effects emerged in all sensitivity analyses, including analyses in which outliers were removed, when only the highest, lowest, and combined effect of

TABLE 2 Pooled effects of Internet interventions on target outcomes compared with control groups

Target outcome	n_c	Effect size			Heterogeneity			95% PI	NNT
		g	95% CI	p	I^2	95% CI	p		
Depression	31	0.18	[0.08, 0.27]	0.001	44	[15, 64]	0.002	-0.26-0.62	9.80
Influence analysis ("leave-one-out") ^a	30	0.20	[0.11, 0.30]	<0.001	38	[3, 60]	0.020	-0.21-0.62	8.93
One ES/study (lowest)	26	0.17	[0.06, 0.28]	0.003	48	[18, 67]	0.004	-0.27-0.61	10.42
One ES/study (highest)	26	0.19	[0.08, 0.31]	0.002	52	[26, 70]	0.001	-0.29-0.68	9.43
One ES/study (combined)	26	0.19	[0.08, 0.29]	0.001	52	[24, 69]	0.001	-0.26-0.63	9.43
Only low risk of bias	13	0.21	[0.03, 0.40]	0.025	59	[24, 78]	0.004	-0.36-0.79	8.47
Anxiety	27	0.27	[0.13, 0.40]	<0.001	51	[24, 68]	<0.001	-0.36-0.90	6.58
Outliers removed ^b	25	0.31	[0.19, 0.43]	<0.001	34	[0, 59]	0.059	-0.20-0.82	5.75
Influence analysis ("leave-one-out") ^c	26	0.30	[0.17, 0.43]	<0.001	45	[12, 65]	0.010	-0.30-0.91	5.95
One ES/study (lowest)	24	0.27	[0.13, 0.42]	<0.001	54	[27, 71]	<0.001	-0.37-0.92	6.58
One ES/study (highest)	24	0.29	[0.15, 0.43]	<0.001	45	[12, 66]	0.009	-0.32-0.89	6.17
One ES/study (combined)	24	0.28	[0.14, 0.42]	<0.001	55	[29, 72]	<0.001	-0.34-0.91	6.41
Only low risk of bias	11	0.22	[0.01, 0.43]	0.041	46	[0, 73]	0.050	-0.42-0.86	8.06
Stress	18	0.20	[0.02, 0.38]	0.030	72	[56, 83]	<0.001	-0.50-0.90	8.93
Outliers removed ^d	16	0.18	[0.05, 0.32]	0.010	57	[24, 75]	0.003	-0.27-0.64	9.80
Influence analysis ("leave-one-out") ^e	17	0.15	[0.01, 0.29]	0.038	64	[39, 78]	<0.001	-0.36-0.66	11.90
One ES/study (lowest)	16	0.22	[0.02, 0.42]	0.034	75	[59, 85]	<0.001	-0.53-0.97	8.06
One ES/study (highest)	16	0.24	[0.06, 0.42]	0.014	71	[52, 83]	<0.001	-0.45-0.93	7.46
One ES/study (combined)	16	0.23	[0.04, 0.42]	0.024	75	[59, 85]	<0.001	-0.50-0.95	7.69
Only low risk of bias	9	0.30	[-0.05, 0.66]	0.084	80	[62, 89]	<0.001	-0.75-1.36	5.95
Well-being	4	0.15	[-0.20, 0.50]	0.259	3	[0, 85]	0.378	-0.64-0.94	11.90
Influence analysis ("leave-one-out") ^f	3	0.25	[0.11, 0.39]	0.016	0	[0, 0]	0.930	-0.18-0.68	7.14
Only low risk of bias	3	0.12	[-0.55, 0.79]	0.526	31	[0, 93]	0.237	-2.98-3.21	14.71
Eating disorders	9	0.52	[0.22, 0.83]	0.004	61	[18, 81]	0.009	-0.32-1.37	3.50
Influence analysis ("leave-one-out") ^g	8	0.61	[0.35, 0.86]	<0.001	39	[0, 73]	0.120	-0.04-1.25	2.99
Only low risk of bias	5	0.63	[0.14, 1.12]	0.023	59	[0, 85]	0.046	-0.50-1.77	2.96
Functioning	9	0.41	[0.26, 0.56]	<0.001	53	[1, 78]	0.029	0.02-0.81	4.39
Influence analysis ("leave-one-out") ^h	8	0.45	[0.10, 0.81]	<0.001	31	[0, 69]	0.180	0.10-0.81	4.00
Only low risk of bias	5	0.41	[0.22, 0.60]	0.004	54	[0, 83]	0.070	-0.05-0.87	4.39

Note. ES: effect size; n_c : number of comparisons; NNT: number-needed-to-treat; PI: prediction intervals.

^aRemoved in leave-one-out-analysis: Greer, 2015 (Mindfulness).

^bRemoved as outliers: Greer, 2015 (Mindfulness); Gaffney et al., 2013.

^cRemoved in leave-one-out-analysis: Greer, 2015 (Mindfulness).

^dRemoved as outliers: Greer, 2015 (Mindfulness); Day et al., 2013.

^eRemoved in leave-one-out-analysis: Day et al., 2013.

^fRemoved in leave-one-out-analysis: Kvillemo et al., 2016.

^gRemoved in leave-one-out-analysis: Zabinski et al., 2000.

^hRemoved in leave-one-out-analysis: Lee et al., 2018.

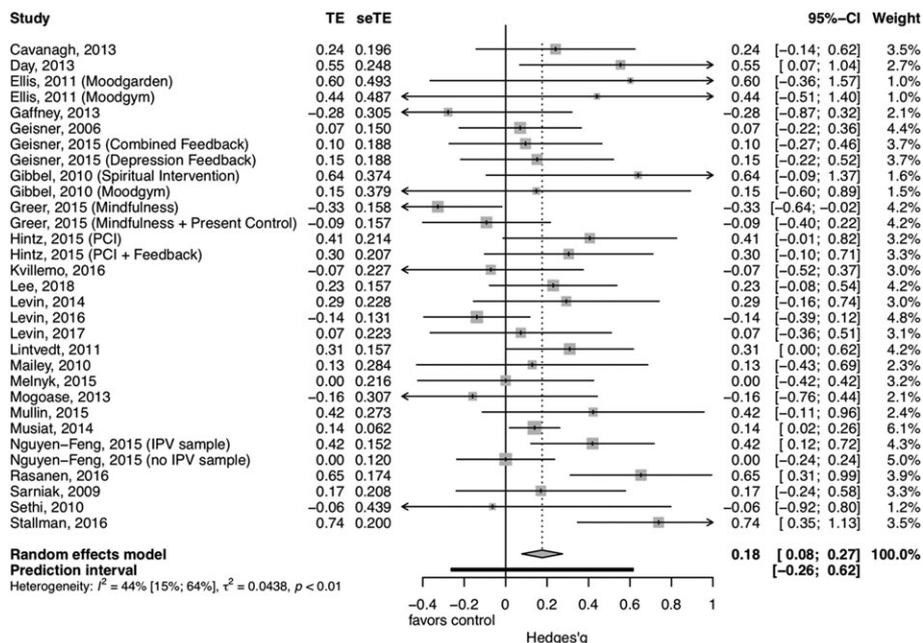


FIGURE 3 Forest plot for depression outcomes

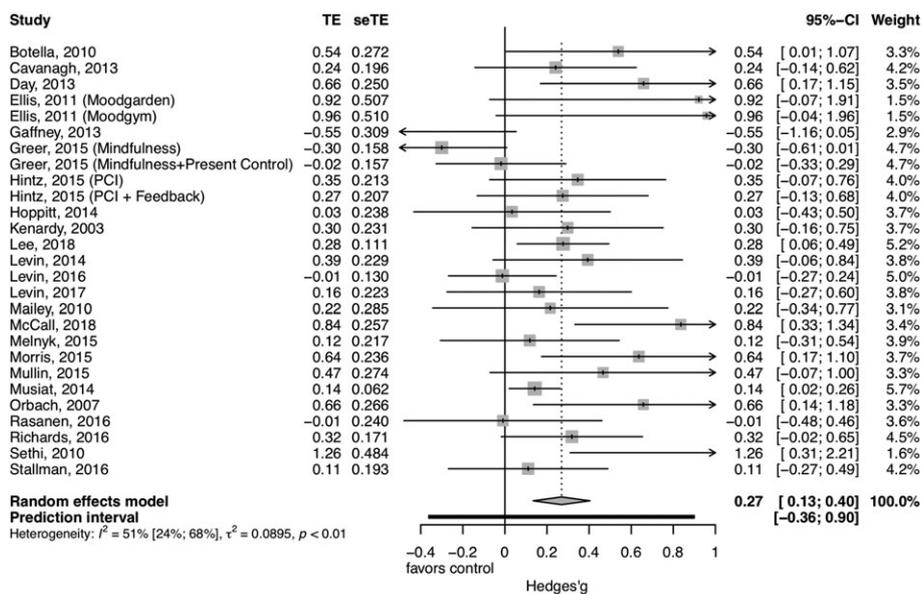


FIGURE 4 Forest plot for anxiety outcomes

multiple comparisons was considered and when only studies with a low risk of bias rating were included, and in the influence analysis. This supports the robustness of this finding. Funnel plot and Egger's test did not hint at publication bias (see Figure S2 and Table S4). The results of the p curve analysis were inconclusive. The test for right-skewness did not indicate the presence of evidential value ($p_{Full} = 0.269$, $p_{Half} = 0.427$, $k = 8$; see Table S5). However, the test for flatness was not significant ($p_{Full} = 0.149$, $p_{Half} = 0.981$, and $p_{Binomial} = 0.423$); p curve's estimate of the average true effect size was Cohen's $d = 0.09$.

3.3.2 | Anxiety

The overall effect size for anxiety (27 comparisons) was $g = 0.27$ (95% CI [0.13, 0.40]), which corresponds with an NNT of 6.58. Heterogeneity was moderate ($I^2 = 51%$; 95% CI [24, 68]). The prediction interval

ranged from $g = -0.36$ to 0.90. When two outliers were removed, the between-study heterogeneity became non-significant ($I^2 = 34%$; 95% CI [0-59]; $p = 0.059$) and a similar effect size of $g = 0.31$ (95% CI [0.19, 0.43], NNT = 5.75) resulted. Results of all the other sensitivity analyses were in line with the main finding. We found strong indications for publication bias. Egger's test was significant (intercept: 1.34; 95% CI [0.24, 2.43]; $p = 0.024$). Duvall and Tweedie's trim and fill procedure imputed seven missing studies. The adjusted average effect size declined to $g = 0.15$ (95% CI [-0.01, 0.31], NNT = 11.90), which was not statistically significant anymore ($p = 0.066$); p curve's right-skewness test also indicated that evidential value was not present ($p_{Full} = 0.052$, $p_{Half} = 0.572$, $k = 9$), but the existence of a small effect could not be rejected ($p_{Full} = 0.420$, $p_{Half} = 0.990$, $p_{Binomial} = 0.957$); p curve's effect size estimate was $d = 0.18$ when an outlier was removed.

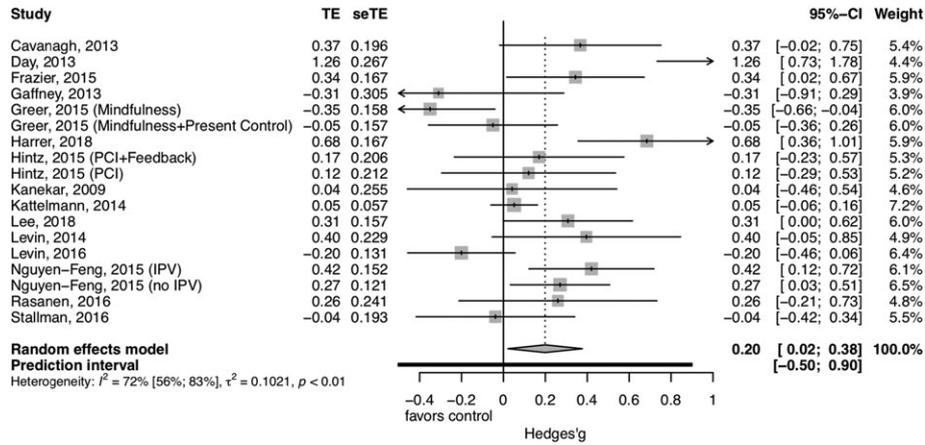


FIGURE 5 Forest plot for stress outcomes

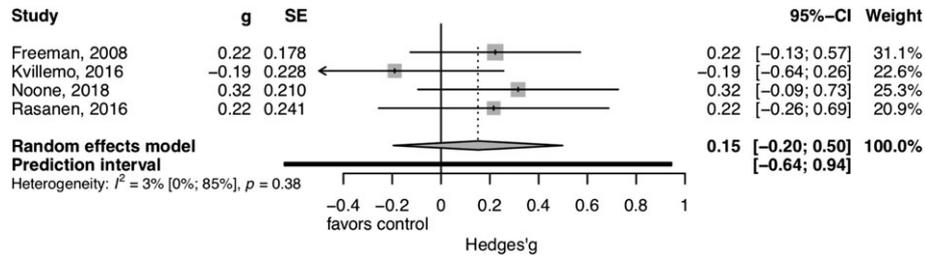


FIGURE 6 Forest plot for well-being outcomes

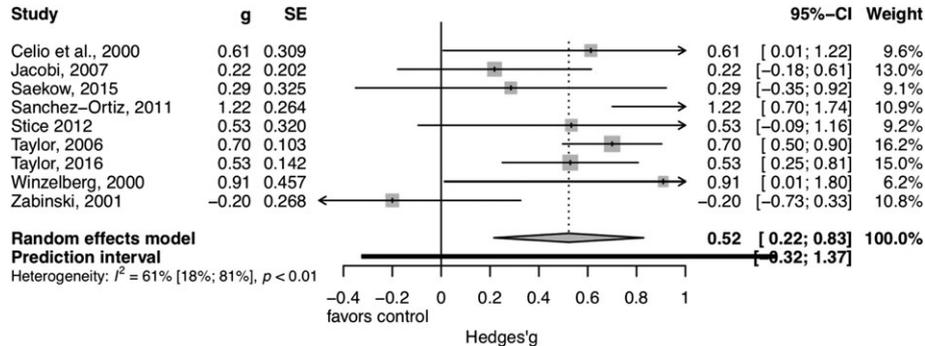


FIGURE 7 Forest plot for eating disorder symptom outcomes

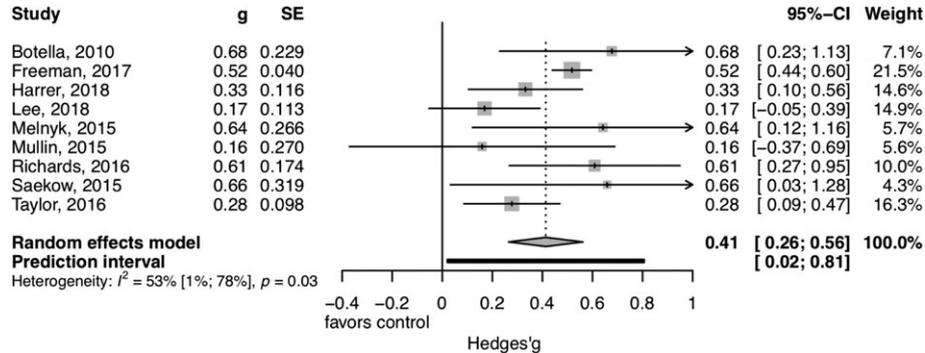


FIGURE 8 Forest plot for functioning outcomes

3.3.3 | Stress

The overall effect of 18 comparisons on stress was $g = 0.20$ (95% CI [0.02, 0.38]). This equals an NNT of 8.93. Heterogeneity was high ($I^2 = 72%$; 95% CI [56–83]). The prediction interval for future trials ranged from $g = -0.50$ to 0.90. The pooled effect estimate

was slightly higher but not significant when only low risk of bias studies were included ($g = 0.30$; 95% CI: [-0.05, 0.66], NNT = 5.95; nine comparisons). In all the other sensitivity analyses, results in line with the main finding emerged. We found no indications of publication bias. The p curve indicated the presence of evidential value.

TABLE 3 Subgroup analyses

Subgroup	Depression						Anxiety						Stress					
	Effect size			Heterogeneity			Effect size			Heterogeneity			Effect size			Heterogeneity		
	<i>n_c</i>	<i>g</i>	95% CI	<i>I²</i>	95% CI	<i>p^a</i>	<i>n_c</i>	<i>g</i>	95% CI	<i>I²</i>	95% CI	<i>p^a</i>	<i>n_c</i>	<i>g</i>	95% CI	<i>I²</i>	95% CI	<i>p^a</i>
Technique						0.027						0.018						0.123
CBT	19	0.28	[0.15, 0.40]	45	[6, 68]		21	0.36	[0.23, 0.50]	43	[5, 66]		9	0.33	[0.02, 0.65]	78	[58, 88]	
Skills training	7	0.04	[-0.23, 0.30]	63	[16, 84]		5	-0.06	[-0.46, 0.35]	59	[0, 85]		9	0.08	[-0.12, 0.28]	60	[16, 81]	
Other	5	0.10	[-0.01, 0.21]	0	[0, 15]		1	0.03	[-0.43, 0.50]	-	-							
Guidance						0.651						0.825						0.865
Feedback	9	0.28	[-0.02, 0.57]	76	[54, 87]		11	0.27	[0.02, 0.52]	62	[27, 80]		7	0.26	[-0.23, 0.74]	85	[71, 92]	
Reminder	6	0.14	[-0.13, 0.41]	33	[0, 73]		5	0.37	[-0.07, 0.80]	67	[17, 88]		2	0.07	[-3.70, 3.83]	80	-	
None	16	0.15	[0.06, 0.25]	0	[0, 48]		11	0.25	[0.02, 0.49]	40	[0, 70]		9	0.21	[0.06, 0.35]	39	[0, 72]	
Treatment length						0.027						0.544						0.101
≤4 weeks	18	0.09	[-0.02, 0.21]	28	[0, 60]		14	0.21	[-0.03, 0.46]	62	[31, 79]		10	0.10	[-0.02, 0.21]	28	[0, 60]	
4-8 weeks	12	0.31	[0.13, 0.49]	59	[23, 78]		11	0.32	[0.16, 0.47]	31	[0, 66]		7	0.30	[0.13, 0.48]	55	[14, 76]	
≥8 weeks	1	0.13	[-0.43, 0.69]	-	-		2	0.54	[-3.40, 4.47]	62	-		1	0.13	[-0.43, 0.69]	-	-	
Recruitment						0.003						0.924						<0.001
Online	6	0.30	[0.25, 0.57]	57	[0, 83]		8	0.30	[0.09, 0.52]	43	[0, 75]		4	0.63	[-0.05, 1.31]	69	[10, 89]	
Mixed	2	0.62	[-1.33, 2.57]	0	-		2	0.25	[-1.95, 2.44]	11	-		1	-0.04	[-0.42, 0.34]	-	-	
Campus	8	0.14	[-0.01, 0.30]	0	[0, 68]		6	0.37	[0.06, 0.70]	12	[0, 78]		5	0.23	[0.03, 0.43]	57	[0, 84]	
Subject pool	7	0.04	[-0.10, 0.17]	0	[0, 57]		4	0.12	[-0.76, 0.99]	78	[40, 92]		2	-0.22	[-0.70, 0.27]	0	-	
Other/n.s.	8	0.20	[-0.09, 0.49]	64	[22, 83]		7	0.27	[-0.13, 0.66]	69	[32, 86]		6	0.04	[-0.21, 0.30]	53	[0, 81]	
Sample						0.026						0.054						0.110
Unselected	16	0.09	[-0.05, 0.23]	51	[12, 72]		16	0.18	[-0.01, 0.38]	57	[26, 76]		12	0.09	[-0.07, 0.26]	58	[20, 78]	
Preselected	15	0.29	[0.16, 0.42]	17	[0, 54]		11	0.42	[0.24, 0.59]	10	[0, 50]		6	0.41	[-0.06, 0.89]	78	[51, 90]	
Control group						<0.001						0.004						<0.001
Active	7	-0.06	[-0.23, 0.11]	50	[0, 79]		8	0.02	[-0.25, 0.29]	59	[9, 81]		5	-0.19	[-0.37, 0.01]	0	[0, 70]	
Passive	24	0.27	[0.17, 0.36]	23	[0, 54]		19	0.39	[0.25, 0.52]	17	[0, 52]		13	0.33	[0.15, 0.51]	68	[43, 82]	
Risk of bias						0.603						0.452						0.264
High	18	0.16	[0.04, 0.28]	37	[0, 64]		16	0.32	[0.12, 0.52]	60	[31, 77]		9	0.11	[-0.06, 0.28]	56	[6, 79]	
Low	13	0.21	[0.03, 0.40]	59	[24, 78]		11	0.22	[0.01, 0.44]	46	[0, 73]		9	0.30	[-0.05, 0.66]	80	[62, 89]	
Compensation						0.006						0.689						0.076
Yes	19	0.08	[-0.05, 0.20]	35	[0, 63]		12	0.25	[-0.06, 0.56]	68	[42, 83]		10	0.08	[-0.12, 0.27]	66	[33, 82]	
No	12	0.31	[0.18, 0.45]	42	[0, 71]		15	0.31	[0.18, 0.43]	23	[0, 58]		8	0.37	[0.04, 0.70]	69	[35, 85]	
Convenience sample						0.913						0.107						0.604
Yes	17	0.19	[0.06, 0.32]	17	[0, 53]		13	0.40	[0.14, 0.65]	53	[11, 75]		4	0.13	[-0.33, 0.59]	44	[0, 81]	
No	14	0.18	[0.02, 0.34]	65	[38, 80]		14	0.18	[0.03, 0.33]	45	[0, 71]		14	0.22	[0.01, 0.44]	77	[61, 86]	

Note. *n_c*: number of comparisons; n.s.: not specified.

^aThe *p* values in this column indicate whether the differences between the effect sizes in the subgroups are significant.

3.3.4 | Well-being

A pooled effect of $g = 0.15$ (95% CI [-0.20, 0.50]) was found for the effect of Internet interventions on well-being (four comparisons). This corresponds with an NNT of 11.90, but the effect was not statistically significant ($p = 0.259$). Heterogeneity was low ($I^2 = 3\%$; 95% CI [0–85]). The prediction interval ranged from $g = -0.64$ to 0.94. A significant effect ($g = 0.25$; 95% CI [0.11, 0.39], NNT = 7.14; $p = 0.016$) was found when leaving out one study in the influence analysis, and the between-study heterogeneity remained low ($I^2 = 0\%$; 95% CI [0–0]). Results in line with the main finding emerged when only studies with a low risk of bias rating were analysed. We found no indications of publication bias. The p curve indicated the presence of a true effect.

3.3.5 | Eating disorder symptoms

A total of nine comparisons on symptoms of disordered eating were analysed. The pooled effect was $g = 0.52$ (95% CI [0.22, 0.83]). This equals an NNT of 3.50. Heterogeneity was moderate ($I^2 = 61\%$; 95% CI [18–81]). The prediction interval ranged from $g = -0.32$ to 1.37. A slightly higher effect of $g = 0.61$ (95% CI [0.35, 0.68], NNT = 2.99) was found when leaving out one study in the influence analysis, and heterogeneity became non-significant ($I^2 = 39\%$; 95% CI [0–73], $p = 0.120$). We found results in line with the main finding when only studies with a low risk of bias rating were included. No indications of publication bias were found. The p curve analysis indicated the presence of evidential value.

3.3.6 | Sleep

Only two studies evaluated the effect of Internet interventions for insomnia relative to controls. These studies were not pooled in meta-analysis. Both interventions had a low risk of bias rating. The calculated effects on sleep were $g = 0.73$ (95% CI [0.63, 0.82], NNT = 2.54; Freeman et al., 2017) and $g = 0.50$ (95% CI [0.05, 0.94], NNT = 3.62; Morris et al., 2016).

3.3.7 | Functioning

The pooled effect of nine comparisons for functioning outcomes was $g = 0.41$ (95% CI [0.26, 0.56]), which corresponds with an NNT of 4.39. Heterogeneity was moderate ($I^2 = 53\%$; 95% CI [1–78]). The prediction interval only included positive values and ranged from $g = 0.02$ to 0.81. A similar effect emerged when leaving one study out in the influence analysis ($g = 0.45$; 95% CI [0.10, 0.81], NNT = 4), but heterogeneity became non-significant ($I^2 = 31\%$; 95% CI [0–69], $p = 0.180$). We also found a similar effect ($g = 0.41$; 95% CI [0.22, 0.60], NNT = 4.39) with non-significant between-study heterogeneity ($I^2 = 54\%$; 95% CI [0–83], $p = 0.07$) when we only pooled the effects of studies with a low risk of bias. We found no indications of publication bias. The p curve indicated the presence of evidential value.

3.4 | Subgroup analyses

Results of subgroup analyses for depression, anxiety, and stress are summarized in Table 3. We found several significant differences between

subgroups. For depression ($p = 0.026$), effects were higher in samples that were preselected through standardized cut-offs ($g = 0.29$, 95% CI [0.16, 0.21], NNT = 6.17) than in unselected samples ($g = 0.09$, 95% CI [-0.05, 0.23], NNT = 20). The pooled effect for interventions in unselected samples did not attain statistical significance ($p = 0.182$).

For all outcomes, effects were significantly higher (all $p < 0.01$) when interventions were compared with passive controls (depression: $g = 0.27$, 95% CI [0.17, 0.36], NNT = 6.58; anxiety: $g = 0.39$, 95% CI [0.25, 0.52], NNT = 4.59; stress: $g = 0.33$, 95% CI [0.15, 0.51], NNT = 5.43) than active control groups (depression: $g = -0.06$, 95% CI [-0.23, 0.11], NNH = 29.41; anxiety: $g = 0.02$, 95% CI [-0.25, 0.29], NNT = 83.33; stress: $g = -0.19$, 95% CI [-0.37, 0.01], NNH = 9.43). The pooled effects of interventions compared with active controls were not significant (all $p > 0.05$).

Intervention technique moderated effects on depression ($p = 0.027$) and anxiety ($p = 0.018$). For both target outcomes, effects were higher for interventions based on CBT principles (depression: $g = 0.28$, 95% CI [0.15, 0.40], NNT = 6.41; anxiety: $g = 0.36$, 95% CI [0.23, 0.50], NNT = 5). Effects were lower and non-significant (all $p > 0.05$) for skill trainings (depression: $g = 0.04$, 95% CI [-0.23, 0.30], NNT = 45.45; anxiety: $g = -0.06$, 95% CI [-0.46, 0.35], NNH = 29.41) and other techniques (depression: $g = 0.10$, 95% CI [-0.01, 0.21], NNT = 17.86; anxiety: $g = 0.03$, 95% CI [-0.43, 0.50], NNT = 62.5).

For depression, effects were highest for interventions between 4 and 8 weeks in length ($g = 0.31$, 95% CI [0.13, 0.49], NNT = 5.75) compared with shorter ($g = 0.09$, 95% CI [-0.02, 0.21], NNT = 20) or longer ($g = 0.13$, 95% CI [-0.43, 0.69], NNT = 13.51) programs ($p = 0.027$). The pooled effect was not significant for shorter programs ($p = 0.099$).

For depression, compensation was also an effect moderator ($p = 0.006$). The effect was higher in studies in which no compensation was provided ($g = 0.31$, 95% CI [0.18, 0.45], NNT = 5.75) compared with studies that compensated participants ($g = 0.08$, 95% CI [-0.05, 0.20], NNT = 21.74). The effect size for studies with compensation was not significant ($p = 0.209$).

Lastly, type of recruitment was a significant effect moderator for depression and stress outcomes (both $p < 0.01$). Effects were lowest when participants were recruited through a study subject pool ($g = 0.04$, 95% CI [-0.10, 0.17], NNT = 45.45; stress: $g = -0.22$, 95% CI [-0.70, 0.27], NNH = 8.06). These effects were not significant (both $p > 0.05$). Effects were higher for web-based recruitment ($g = 0.30$, 95% CI [0.25, 0.57], NNT = 5.95; stress: $g = 0.63$, 95% CI [-0.05, 1.31], NNT = 2.91).

We found no indication that guidance, risk of bias, or employment of convenience samples were significantly related to effect size (all $p \geq 0.05$).

4 | CONCLUSIONS

In this meta-analysis on Internet interventions for mental health and well-being in university students, we found small effects on depression, anxiety, and stress symptoms, as well as moderate-sized effects on eating disorder symptoms and students' social and academic functioning. No significant effects were found for interventions targeting student's well-being. Heterogeneity of effect sizes was moderate to substantial for anxiety, stress, eating disorder, and functioning outcomes. The small effect on depression as well as the moderate effects on eating disorder symptoms and student functioning found in the main analysis also emerged when accounting for potential publication

bias and when only studies with a low risk of bias were included. In subgroup analyses, we found that effects were higher in samples that were preselected through symptom cut-offs or risk factors, as well as for interventions that were of medium length (4–8 weeks), based on CBT principles, and were compared with passive control groups. Higher effects were also found when participants were not given any compensation and were not recruited through a study subject pool.

The effects on depression ($g = 0.18$, 95% CI [0.08, 0.27]), anxiety ($g = 0.27$, 95% CI [0.13, 0.40]), and stress ($g = 0.20$, 95% CI [0.02, 0.38]) in this meta-analysis are much smaller than found for such interventions in other target groups (depression: SMD = 0.90, 95% CI [0.73, 1.04]; Königbauer, Letsch, Doebler, Ebert, & Baumeister, 2017; anxiety: SMD = 0.80, 95% CI [0.42, 1.19]; Olthuis, Watt, Bailey, Hayden, & Stewart, 2015; stress: SMD = 0.43, 95% CI [0.31, 0.54]; Heber et al., 2017). This might be explained due to differences in intervention or sample characteristics, such as baseline symptom severity. Two recent meta-analyses report much smaller effects for Internet interventions aiming to prevent depression in subclinical populations (SMD = 0.25–0.35; Sander, Rausch, & Baumeister, 2016; Deady et al., 2017). However, these effects are still considerably larger than the one we found in unselected samples ($g = 0.09$, 95% CI [−0.05, 0.23]). It is also possible that Internet interventions for depression, anxiety, and stress are less effective in university students than in other target groups. The estimated effect size for depression adjusted for publication bias ($d = 0.09$) is considerably lower than the minimally important difference of SMD = 0.24 reported for depression outcomes (Cuijpers, Turner, Koole, Van Dijke, & Smit, 2014). This questions the clinical usefulness of treating depressive symptoms in students using Internet-based approaches. For anxiety, controlling for potential publication bias lead to a non-significant overall effect. Nevertheless, effect heterogeneity was moderate to substantial in many analyses, which is also reflected by the broad prediction intervals. Predictions for future trials based on present evidence ranged from negative effects to moderate and even large positive effects.

Given that previous research has clearly documented the enormous potential of Internet-based interventions for other target groups and areas of application (Andersson & Titov, 2014; Ebert et al., 2018), more research is clearly needed into how Internet interventions should be designed and delivered to exploit these capacities in university students. Results from our subgroup analyses indicate that effects are higher for interventions of moderate length (1–2 months), which is in line with previous research (Heber et al., 2017; Richards & Richardson, 2012). Findings in this meta-analysis also suggest that CBT programs were superior to other types of interventions. Although previous research suggests that guided Internet interventions have higher effect sizes than unguided interventions (Baumeister, Reichler, Munzinger, & Lin, 2014; Cowpertwait & Clarke, 2013), we did not find that guidance significantly moderated intervention efficacy. Apart from guidance, interventions in this analysis also varied considerably in terms of their length, intensity, and rationale, which may have impeded us from detecting the benefits of adding guidance to an intervention. However, it is also possible that provision of guidance could play a less crucial role in university students, and other factors are more important.

It is also very much possible that some students are more likely than others to respond to Internet interventions due to a range of

prescriptive predictors of treatment response that remain to be determined. It is noteworthy, in the latter regard, that substantial evidence exists for heterogeneity of treatment effects of standard psychotherapies and medications for the treatment of common mental disorders, based on a wide range of patient characteristics (e.g., childhood experiences, personality, coping style, symptom profiles and comorbidity, exposure to chronic stressors, and access to supportive social networks; Cohen & DeRubeis, 2018; Kessler et al., 2017; Lutz, Zimmermann, Müller, Deisenhofer, & Rubel, 2017). One main aim of the WMH-ICS is to carry out comparable analyses with the Internet interventions implemented as part of the initiative. If the results are in any way comparable with those found for face-to-face psychotherapies, we might be able to find subgroups of students among whom the effect sizes of certain Internet interventions are much higher than those in the total population, as well as other students for whom Internet interventions are likely to have no positive effects. Our finding in the subgroup analyses that effects were larger when participants were preselected through symptom cut-offs or risk factors points at this direction. If so, we hope to develop reliable clinical decision support systems based on artificial intelligence methods (e.g., Luedtke & van der Laan, 2017) to help match students in need of treatment with optimal Internet interventions and to determine which students need referrals to other types of treatment.

This study has several limitations. About half of the included studies were determined to show a high risk of bias. Therefore, results should be interpreted with caution. Furthermore, as long-term effect data were only reported for a small proportion of the included studies, and follow-up periods varied considerably, we were not able to pool such outcomes. Heterogeneity was substantial in some analyses and remained moderate even after outliers were removed. We also found evidence that some analyses could be biased by selective reporting. Given the shortcomings of the trim and fill procedure and p curve described before, there is currently no adequate method to accurately estimate effect sizes in the presence of both substantial heterogeneity and publication bias (van Aert et al., 2016). Results of analyses in which both these criteria were met should therefore be interpreted with caution. Lastly, we used Cohen's criteria to assess the magnitude of effects in this meta-analysis. Although these guidelines are commonly used in psychological research, it should be noted that there are no iron-clad criteria to assess the importance of an effect (Durlak, 2009). Effect sizes should thus be interpreted within the context of previous research, which we presented before.

Despite these limitations, we conclude that Internet-based mental health interventions for university students can be a potentially effective mean for a range of conditions and can have a beneficial impact on university students' functioning. Nevertheless, more research is needed to determine which types of interventions best fit which students, and in which context, to optimize their effects and thus fully exploit the potential of Internet-based interventions in improving university students' mental health.

ACKNOWLEDGEMENTS

We would like to thank Dr. Helen Stallman, Dr. Laura A. Szalacha, Dr. Bernadette Mazurek Melnyk, and Dr. Chris Noone for providing us with original data used in this analysis.

CONFLICT OF INTEREST

D. D. E. reports to have received consultancy fees or served in the scientific advisory board from several companies such as Minddistrict, Sanofi, Lantern, Schön Kliniken, and German health insurance companies (BARMER and Techniker Krankenkasse). D. D. E. and M. B. are also stakeholders of the institute for health trainings online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care. H. B. reports to have received consultancy fees and fees for lectures or workshops from chambers of psychotherapists and training institutes for psychotherapists. In the past 3 years, R. C. K. received support for his epidemiological studies from Sanofi-Aventis, was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, Takeda, and served on an advisory board for the Johnson & Johnson Services Inc., and Lake Nona Life Project. R. C. K. is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. All other authors report no potential conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Harrer M, Adam SH, Baumeister H, et al. Internet interventions for mental health in university students: A systematic review and meta-analysis. *Int J Methods Psychiatr Res*. 2019;28:e1759. <https://doi.org/10.1002/mpr.1759>

SPECIAL ISSUE

Efficacy of an unguided internet-based self-help intervention for social anxiety disorder in university students: A randomized controlled trial

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BARMER

Abstract

Objectives: Internet- and mobile-based interventions (IMIs) offer the opportunity to deliver mental health treatments on a large scale. This randomized controlled trial evaluated the efficacy of an unguided IMI (StudiCare SAD) for university students with social anxiety disorder (SAD).

Methods: University students ($N = 200$) diagnosed with SAD were randomly assigned to an IMI or a waitlist control group (WLC) with full access to treatment as usual. StudiCare SAD consists of nine sessions. The primary outcome was SAD symptoms at posttreatment (10 weeks), assessed via the Social Phobia Scale (SPS) and the Social Interaction Anxiety Scale (SIAS). Secondary outcomes included depression, quality of life, fear of positive evaluation, general psychopathology, and interpersonal problems.

Results: Results indicated moderate to large effect sizes in favor of StudiCare SAD compared with WLC for SAD at posttest for the primary outcomes (SPS: $d = 0.76$; SIAS: $d = 0.55$, $p < 0.001$). Effects on all secondary outcomes were significant and in favor of the intervention group.

Conclusion: StudiCare SAD has proven effective in reducing SAD symptoms in university students. Providing IMIs may be a promising way to reach university students with SAD at an early stage with an effective treatment.

KEYWORDS

internet-based treatment, social anxiety disorder, unguided self-help, university students

1 | INTRODUCTION

Social anxiety disorder (SAD) is the most common anxiety disorder in the general population (Kessler, Chiu, Demler, & Walters, 2005). Prevalence estimates for SAD in university students show a wide range from 3.4% (12 months) in the United States (Blanco et al., 2008) to 16.1% (point prevalence) in Sweden (Tillfors & Furmark, 2007).

University students with SAD face a number of adverse effects including problems with identity formation (Gültekin & Dereboy, 2011), increased consumption of alcohol (Gilles, Turk, & Fresco, 2006), higher levels of suicidal ideation (Olfsen, 2000), and lower quality of life (Mendlowicz, 2000). In addition, emotional distress due to SAD triggers dysfunctional avoidance strategies (Tillfors & Furmark, 2007), which are associated with underachievement and may lead to university dropout. The resulting lower qualification and social impairment (Kessler, 2003; Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996) may subsequently lead to a high economic burden for those affected as well as for society at large. Thus, treatment of SAD is of interest to the public health care system and health services in and outside of the university setting (Wittchen & Jacobi, 2005; Wittchen, Jacobi, Rehm, & Gustavsson, 2011), particularly as SAD can manifest as a chronic condition when untreated (Chartier, Hazen, & Stein, 1998).

However, only a fraction of those in need (Runge, Beesdo, Lieb, & Wittchen, 2008; Wang et al., 2005) receive help. Reasons for this unmet need include shortage in available clinicians and fear of stigmatization. Furthermore, the fear of negative evaluation (FNE; Rapee & Heimberg, 1997; Stangier, Heidenreich, & Peitz, 2009), the expectation that others might judge one's behavior as embarrassing (Kessler, 2003; King & Poulos, 1998), a key feature of SAD, prevents university students from seeking professional advice (Kessler, 2003; King & Poulos, 1998).

Internet- and mobile-based interventions (IMIs) are a promising strategy to overcome treatment barriers by offering a low-access threshold, anonymous, flexible, and effective treatment option (Ebert, Cuijpers, Muñoz, & Baumeister, 2017; Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006). IMIs have been shown to be effective in the treatment of a broad range of disorders (Ebert, Van Daele, et al., 2018b). The latest systematic review on IMIs for SAD found a mean standardized effect size of $g = 0.84$ (0.72–0.97) compared with untreated control groups and $g = 0.38$ (0.13–0.62) compared with active control conditions (Kampmann, Emmelkamp, & Morina, 2016).

Most studies to date that targeted SAD evaluated guided IMIs. However, once developed, costs of IMIs are substantially linked to professional guidance time, which clearly limits their possible reach and consequently lowers the potential to reduce the negative consequences of SAD at population level. Thus, in light of technological developments that allow them to mimic some functions of human support, unguided IMIs have received more attention. The most recent meta-analysis found an average effect of $g = 0.78$ (95% confidence interval [CI] [0.50, 1.05]) for unguided IMIs compared with passive controls ($n = 8$) and of $g = 0.19$ (95% CI [-0.08, 0.46]) compared with active conditions ($n = 7$; Kampmann et al., 2016).

However, effect sizes of unguided treatment vary widely (95% CI [0.28, 1.47]; Berger et al., 2011; Botella et al., 2010; Furmark et al., 2009; Gallego, Emmelkamp, Maria, van der Kooij, & Mees, 2011;

Lopez, Botella, Quero, Gomez, & Baños, 2014; Titov et al., 2010; Titov, Andrews, Choi, Schwencke, & Johnston, 2009; Titov, Andrews, Choi, Schwencke, & Mahoney, 2008) and high dropout >40% at posttreatment (Botella et al., 2010; Gallego et al., 2011). Therefore, additional research is needed to investigate the efficacy of unguided IMIs as treatment of SAD.

We are aware of two studies that evaluated internet-based cognitive behavioral therapy (iCBT) for SAD in university students. A small open trial ($n = 38$) that delivered PDFs with self-help material and offered minimal contact with a psychotherapist resulted in large pre-post within-group effects (Social Interaction Anxiety Scale [SIAS]: $d = 0.81$; Social Phobia Scale [SPS]: $d = 1.18$) for both the iCBT group and the iCBT group with additional in vivo group exposure (Tillfors et al., 2008). Another unguided web-based intervention that was personalized to each user's symptoms yielded smaller pre-post effect sizes in a non-clinical sample of psychology students (e.g., SIAS: $d = 0.72$; McCall, Richardson, Helgadottir, & Chen, 2018).

Although the efficacy of cognitive behavioral therapy (CBT) in the treatment of SAD is well documented (Kampmann et al., 2016), there is still room for improvement. Recent findings suggest that FNEs are a central feature of SAD and document a strong link between SAD and the fear of positive evaluation (FPE; Hedman et al., 2011; Weeks, Heimberg, & Rodebaugh, 2008; Weeks, Heimberg, Rodebaugh, Goldin, & Gross, 2012). According to Weeks and Howell's (2012) bivalent fear of evaluation model of social phobia, fear of evaluation in general is the core component of SAD, including not only FNE but also FPE. Empirical evidence shows that FPE and FNE are related but distinct factors contributing to social anxiety, with FPE explaining a unique and independent proportion of variance in the fear of social interactions (Weeks, Jakatdar, & Heimberg, 2010). Even though established treatments for SAD do not address FPE directly, there is evidence that CBT can reduce FPE, albeit with smaller effect sizes compared with FNE (Weeks et al., 2012). Neglecting this component of SAD in the treatment may impede treatment progress, such as when clients still feel anxious after successful exposures that received positive feedback (Weeks & Howell, 2014). Even though research has shown that FPE is sensitive to CBT (Fergus et al., 2009), to our knowledge, no intervention exists that systematically addresses this as a treatment component of SAD. Thus, the intervention used in our study was enhanced by one module on FPE.

The current study evaluated whether an unguided internet-based intervention complemented by one module on FPE is effective in treating SAD in university students when compared with a waitlist control group (WLC). This study is part of the recently launched World Health Organization World Mental Health Surveys International College Student Project (WMH-ICS; www.hcp.med.harvard.edu/wmh/college_student_survey.php; Bruffaerts et al., 2018; Mortier et al., 2017). The WMH-ICS was initiated to obtain accurate longitudinal data on the prevalence and correlates of mental disorders among university students, assess unmet needs for treatment, evaluate a wide range of interventions (a number of them developed in the context of WMH-ICS) to prevent and treat these disorders, and develop precision medicine clinical decision support tools to match the right students to the most appropriate treatments.

2 | METHODS

2.1 | Design and procedure

Using a two-arm randomized controlled design, $N = 200$ participants were randomly allocated (block size of 8, varying ratio) to an internet-based unguided CBT ($n = 100$) or to a 6-month WLC group ($n = 100$). Both groups had full access to treatment as usual. Randomization was performed using an internet-based randomization program (Randlist) and carried out by an independent researcher not otherwise involved in the study. All questionnaires were assessed online at baseline (T0), 10 weeks (T1, posttreatment), and 6 months (T2) after randomization. The WLC group received access to the intervention following T2. In this study, we only report pretreatment and posttreatment data. The trial was registered at the German Clinical Trials Register (DRKS00011424). More details on the study design can be found in the study protocol (Kählke et al., 2018). All procedures involved in the study were consistent with the generally accepted standards of ethical practice and were approved by the ethical committee of the University of Erlangen–Nuremberg (reference number 260_16 B, 13.09.2016).

2.2 | Participants

Participants had to be at least 18 years of age, enrolled as university students, scoring above predefined cutoff scores on the SPS (>21) or SIAS (>32), and meeting diagnostic criteria of SAD according to the Structured Clinical Interview for DSM-IV Axis I Disorders. The interviews were conducted by trained interviewers via telephone (Rohde, Lewinsohn, & Seeley, 1997). Interrater reliability was evaluated in 20% of randomly selected cases. Cohen's kappa was $\kappa = 0.78$, which indicates good agreement across raters (Landis & Koch, 1977).

We excluded applicants who were either at risk of suicide (Beck Suicide Item > 1) or receiving psychotherapy at the time of entering the study or had a known diagnosis of a psychotic, bipolar, or another severe mental disorder. Prescription medications for anxiety and depression lead to an exclusion if the dosage had changed within 1 month before the beginning of the study. Participants were recruited in Germany, Austria, and Switzerland from January 2017 to February 2018 primarily through circular e-mails sent to enrolled students at a number of German, Austrian, and Swiss universities.

2.3 | Intervention

The intervention is based on the cognitive behavioral treatment model for social phobia by Clark and Wells (1995). This model has been shown to be efficacious in previous studies in general population samples (Berger et al., 2011; Berger, Hohl, & Caspar, 2009, 2010; Boettcher, Berger, & Renneberg, 2012; A. Schulz et al., 2016; Stolz et al., 2018). The original intervention was specifically adapted to the university setting, for example, by providing case examples of socially anxious students. The intervention consisted of nine text-based sessions, various exercises (e.g., attention training), and diaries (such as a diary aimed to identify and challenge negative thoughts).

Participants were asked to work on one session weekly, to revise the exercises, and to fill in the diaries. The approximate time required to complete one session was 60 min plus the time required to implement treatment strategies in their daily life routine.

The first three intervention sections are composed of motivational enhancement (Session 1), psycho-education (Session 2), and identification and modification of negative thoughts through a thought diary (Session 3). The fourth session consists of a module not in the original Clark and Wells model that teaches participants how to identify and modify FPE-related cognitions (Session 4). This module provides information on the definition and etiology of FPE regarding the bivalent fear of evaluation model (Weeks & Howell, 2012), the evolutionary model (Gilbert, 2014), and FPE-related cognitive strategies such as the disqualification of positive social outcomes. Identification and modification of FPE-related cognitions as well as perceived costs and advantages of positive evaluation are supported by a thought diary and complemented by exercises that facilitate self-compassion and the experience and acceptance of positive emotions, both of which have been linked to a reduction of FPE (Werner, Goldin, Ball, Heimberg, & Gross, 2011). In Sessions 5–7, participants are then introduced to exercises to reduce self-focused attention, including behavioral experiments such as in vivo exposures. Session 8 includes information about healthy lifestyle (e.g., sports and nutrition) and conveyed problem solving skills. Finally, Session 9 provides strategies to maintain the acquired skills and to prepare for relapses.

Although the intervention does not include any therapeutic guidance, participants receive standardized automatic messages aiming to promote adherence. Adherence reminders follow procedures used in a number of previously conducted studies (Ebert et al., 2016; Ebert, Buntrock, et al., 2018; Zarski et al., 2016) consisting of one positive reinforcement per session completion and one automatic reminder if participants do not log into the platform for more than one week. These automated reminders contain standardized motivational messages that encourage participants to continue to work with the program. A more detailed description of the StudiCare SAD can be found in the protocol of the trial (Kählke et al., 2018).

2.4 | Primary outcome measures

The primary outcome measures assess SAD symptoms with the SPS and the SIAS (Stangier, Heidenreich, Berardi, Golbs, & Hoyer, 1999). These two self-report questionnaires complement one another and are usually administered together. The SIAS assesses more general fears of social interaction (e.g., "I tense up if I meet an acquaintance in the street"), whereas the SPS focuses on fears of being judged by others during daily activities (e.g., "I become anxious if I have to write in front of others."). Each scale consists of 20 items rated on a 5-point Likert scale (0 = "not at all" to 4 = "extremely"). These two measures have been found to be valid, reliable, and useful for clinical and research purposes (Mattick & Clarke, 1998). Cronbach's α for the SIAS and SPS ranges from 0.90 to 0.94 (Heinrichs et al., 2002). In the present study, Cronbach's α at T1 was 0.91 for the SPS and 0.92 for the SIAS.

2.5 | Secondary outcome measures

Fear of positive social feedback was assessed using the Fear of Positive Evaluation Scale (FPES; Weeks, Heimberg, Rodebaugh, & Norton, 2008). The FPES is a self-report instrument, which consists of 10 items and has shown good psychometric properties in clinical and healthy samples (Fergus et al., 2009; Weeks, Heimberg, Rodebaugh, & Norton, 2008). The disqualification of positive social outcomes is a cognitive strategy that has been related to FPE (Weeks, Heimberg, Rodebaugh, & Norton, 2008; Weeks & Howell, 2012). This cognitive tendency is assumed to represent a mental safety behavior in the context of FPE and was measured using the Disqualification of Positive Social Outcomes Scale (DPSOS; Weeks, 2010). The DPSOS comprises 13 items and measures disqualification of positive outcomes towards other-oriented and self-oriented attributions. Cronbach's α in the current sample for FPE was 0.78, and for DPSOS, it was 0.91.

Depression severity was assessed using the Beck Depression Inventory II (Hautzinger, Keller, & Kühner, 2006). The scale consists of 21 items each rated on a 4-point Likert scale. Prior research has shown high reliability and validity in SAD clients (Berger et al., 2011). Cronbach's α in the present study was 0.89.

General psychopathology was assessed using the Brief Symptom Inventory, which spans nine dimensions, including insecurity in social situations, anxiety, depressiveness, and compulsivity (Franke, 2000). The Brief Symptom Inventory assesses symptoms within the past week and has shown robust psychometric properties (Schlarb & Hautzinger, 2011). Cronbach's α in the current sample was 0.96.

The Liebowitz Social Anxiety Scale (Liebowitz, 1987; Stangier & Heidenreich, 2003) assesses self-reported fear and avoidance in 24 different situations. Thirteen of the situations relate to performance and the remaining items to situations within the context of social interactions. Prior research has shown good to excellent reliability and validity (Stangier & Heidenreich, 2003). In this study, Cronbach's α was 0.95.

Difficulties in interpersonal behavior and causes of relational distress as indicated assertiveness and passivity of participants were assessed using the Inventory of Interpersonal Problems. The instrument has eight dimensions and shown adequate psychometric properties (Horowitz, Rosenberg, Baer, Ureño, & Ai, 1988; Horowitz, Strauß, & Kordy, 2000). Cronbach's α in the present study was 0.94.

The Assessment of Quality of Life (AQoL; Richardson, Iezzi, Khan, & Maxwell, 2014) measured quality of life. The AQoL-8D comprises 35 items on eight dimensions (independent living, pain, senses, mental health, happiness, coping, relationships, and self-worth) and allows for the calculation of separate sum scores for each dimension. The AQoL is a reliable and valid instrument (Richardson et al., 2014; Cronbach's α = 0.96). In this sample α was 0.93.

The German Client Satisfaction Questionnaire (Schmidt, Lamprecht, & Wittmann, 1989) adapted to the online training context was administered to examine the acceptance of internet-based interventions and global client satisfaction on the intervention (Boß et al., 2016).

2.6 | Sample size calculation

The study was powered to detect small to medium effect sizes of $d = 0.4$ between the conditions in the intention-to-treat (ITT) analysis, using a one-sided test, with 80% power, adjusted for multiple testing due to two primary outcome tests. Hence, 100 participants were included per condition.

2.7 | Statistical analyses

All analyses are reported according to the Consolidated Standards of Reporting Trials statement (K. F. Schulz, Altman, & Moher, 2010) using ITT procedures. Additionally, study completer, that is, including only those that provided data at follow-up, were reported as sensitivity analysis. Analyses were performed using IBM SPSS version 25 (IBM SPSS, 2017). Multiple imputation using a Markov chain Monte Carlo multivariate imputation algorithm was used to handle missing data (Little & Rubin, 2002). Ten single estimations of the missing values were calculated based on the valid data for all available data at all assessment points (T0 and T1).

The intervention group (IG) and WLC were compared at 10 weeks (T1) using analysis of covariance (ANCOVA) with baseline levels as covariates. The primary outcome analyses were adjusted for multiple testing; hence, α was set at <0.025 for the primary outcome tests and <0.05 for all other tests. Cohen's d with 95% CIs was calculated based on the imputed dataset by comparing the means and SDs of the IG and WLC groups at posttest. According to Cohen (1988), $d = 0.2$ can be considered a small effect, $d = 0.5$ a medium effect, and $d = 0.8$ a large effect.

To determine the numbers of participants achieving a reliable, positive outcome, we coded participants as responders or non-responders according to the widely used Reliable Change Index of Jacobson and Truax (1991) using the following formula: $1.96 \times SD \times \sqrt{2} \times \sqrt{1 - rel}$. Therefore, we used the standard deviation of the whole sample at T0 ($SD_{SPS} = 12.68$, $SD_{SIAS} = 12.16$) and the retest reliability of the SPS ($r_{tt} = 0.96$) and SIAS ($r_{tt} = 0.92$) according to the test authors (Stangier et al., 1999). The participants were defined as having reliably changed if their SPS score differed more than $(-)/7.03$ points and their SIAS score more than $(-)/9.53$ points from T0 to T1. To investigate potential negative effects on individual level, we also calculated the number of participants that displayed a reliable symptom deterioration from baseline to posttreatment $(+7.03)$ using the Reliable Change Index.

Participants were rated as symptom-free if they scored 17 or below on the SPS and 26 or below on the SIAS (Stangier et al., 1999). Additionally, the numbers needed to treat (NNT), indicating the number of participants that have to be treated to generate one additional treatment response/symptom-free status as compared with the control group, were calculated (Altman, 1998; Cook & Sackett, 1995).

3 | RESULTS

3.1 | Participants

A total of 603 individuals were screened for eligibility, and 387 were excluded primarily because they either scored below the cutoff (109/603) or because of a lack of informed consent/baseline (175/603). Subsequently, 16 participants were excluded due to no SAD diagnosis ($n = 10$), other mental disorders that require treatment ($n = 5$), and suicidal ideation ($n = 16$). Overall, 7.5% ($n = 15$) of participants did not provide data at T1. No significant differences were found between the IG ($n = 9$, 9%) and WLC ($n = 6$, 6%) with regard to missing data, $\chi^2(1) = 0.649$, $p = 0.421$. The study flow is illustrated in Figure 1.

Baseline socio-demographic and clinical characteristics were balanced across groups and are displayed in Table 1. The average age of the participants was 26.70 years ($SD = 6.34$). The sample was primarily female (124/200, 62%) and consisted mostly of full-time students ($n = 170$, 85%), who were related to medical fields ($n = 77$, 39.1%). Half of them were married or in a relationship ($n = 102$, 51.0%). Having received psychotherapy in the past was endorsed by 68 persons (34.0%). Table 2 summarizes all means and SDs for all outcome measures.

The most common reason that participants indicated why they applied for participation in the internet-based treatment was that they found an internet-based intervention easier to integrate into

daily life than an regular outpatient therapy (63.5%, $n = 127$) followed by a general interest in such a new treatment approach (56%, $n = 112$). Approximately one third (34.5%, $n = 69$) indicated that they were not willing to use any outpatient face-to-face psychotherapy. Only one fifth (20%, $n = 43$) of the participants stated that the most important reason for getting involved in the study was that waiting times for psychological therapy were too long. Only the minority of the participants were unsatisfied with former treatment (10.5%, $n = 21$) or indicated a limited access to treatment (2%, $n = 4$).

3.2 | Treatment adherence and other treatment

On average, participants in the IG completed 5.18 ($SD = 2.65$) of the nine sessions (58% of the intervention). Of the 100 individuals participating in the IG, Session 1 was completed by 96 of the participants (96%), Session 2 by 92 (92%), Session 3 by 85 (85%), Session 4 by 71 (71%), Session 5 by 58 (58%), Session 6 by 40 (40%), Session 7 by 31 (31%), Session 8 by 24 (24%), and Session 9 by 21 (21%) of the participants.

In the WLC condition, three participants (3.0%) indicated at T1 that they had received other help within the previous 10 weeks (e.g., psychotherapy and health training other than the StudiCare SAD) as opposed to two participants (2.0%) in the IG condition.

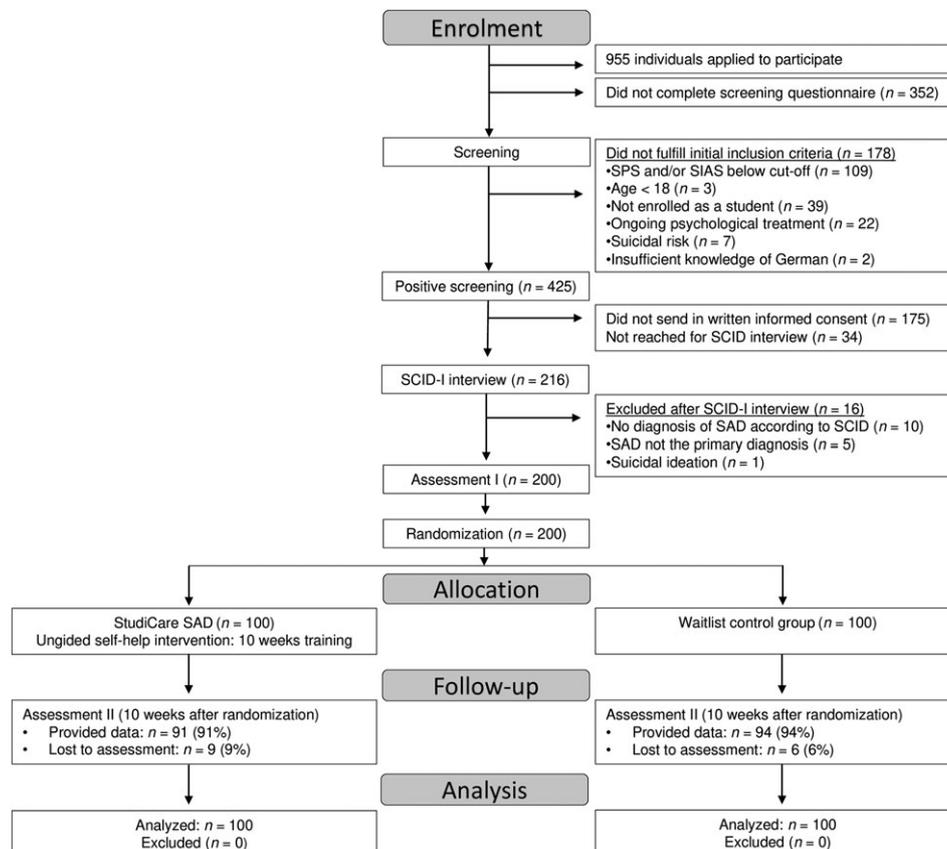


FIGURE 1 Flow of participants. SPS: Social Phobia Scale; SIAS: Social Interaction Anxiety Scale; SAD: social anxiety disorder; SCID-I: Structured Clinical Interview for DSM-IV Axis I Disorders

TABLE 1 Baseline sample characteristics

Characteristic	All participants (N = 200)	IG (n = 100)	WLC (n = 100)
	N (%)	N (%)	N (%)
Sociodemographic characteristics			
Age (M, SD)	26.70 (6.34)	26.71 (6.08)	26.68 (6.61)
Gender, female	124 (62.0%)	63 (63.0%)	61 (61.0%)
Married or in a relationship	102 (51.0%)	52 (52.0%)	50 (50.0%)
Citizenship			
Germany	150 (75.0%)	74 (74.0%)	76 (76.0%)
Switzerland	40 (20.0%)	21 (21.0%)	19 (19.0%)
EEA member	3 (1.5%)	1 (1.0%)	2 (2.0%)
No EEA member	7 (3.5%)	4 (4.0%)	3 (3.0%)
Study characteristics			
Full-time student	170 (85.0%)	86 (86.0%)	84 (84.0%)
Part-time student	30 (15.0%)	14 (14.0%)	16 (16.0%)
Semester (M, SD)	5.09 (3.38)	4.65 (3.15)	5.53 (3.56)
Taking less classes due to SAD	40 (20.0%)	15 (15.0%)	25 (25.0%)
ECTS taken less on average (M, SD)	2.14 (5.73)	1.49 (4.97)	2.79 (6.36)
Field of study			
Psychology	53 (26.9%)	33 (33.3%)	20 (20.4%)
Medicine & Pharmaceuticals	24 (12.2%)	9 (9.1%)	15 (15.3%)
Business & Law	35 (17.8%)	16 (16.2%)	19 (19.4%)
Literature & Media	8 (4.1%)	2 (2.0%)	6 (6.1%)
Educational sciences	13 (6.6%)	4 (4.0%)	9 (9.2%)
Engineering	30 (15.2%)	18 (18.2%)	12 (12.2%)
Linguistics, culture, and social studies	15 (7.6%)	10 (10.1%)	5 (5.1%)
Mathematics and other sciences	19 (9.6%)	7 (7.1%)	12 (12.2%)
Work characteristics			
Employed	106 (53.0%)	58 (58.0%)	48 (48.0%)
Full-time employed	17 (8.5%)	9 (9.0%)	8 (8.0%)
Chronic conditions			
Any chronic condition	127 (64.0%)	66 (66.0%)	61 (61.0%)
Treatment utilization			
Previous psychotherapy	68 (34.0%)	38 (38.0%)	30 (30.0%)
Medication at T0	5 (2.5%)	3 (3.0%)	2 (2.0%)

Note. ECTS: European Credit Transfer System; EEA: European Economic Area; SAD: social anxiety disorder.

3.3 | Primary outcome analyses

3.3.1 | Intervention effect

Changes from baseline to posttest in the IG were large for both primary outcomes according to Cohen's criteria (SPS: $d = 1.14$, 95% CI [0.84, 1.44]; SIAS: $d = 1.17$, 95% CI [0.87, 1.47]), whereas within-group changes in the WLC were small to moderate (SPS: $d = 0.37$, 95% CI [0.09, 0.65]; SIAS: $d = 0.32$, 95% CI [0.04, 0.6]).

As shown in Table 3, a significant group effect in the ANCOVA indicated lower scores on both primary outcome measures for the IG relatively to the WLC at T1, SPS: $F(1, 197) = 94.65$, $p < 0.001$; SIAS: $F(1, 197) = 122.51$, $p < 0.001$. Effect sizes for differences between the groups were moderate for the SIAS ($d = 0.55$, 95% CI [0.27, 0.83]) and moderate to large for the SPS ($d = 0.76$, 95% CI [0.47, 1.04]).

3.3.2 | Treatment response, symptom-free status and symptom deterioration

At T1, more participants in the IG showed reliable improvement compared with those in the WLC based on both the SPS (IG: $n = 68$, 68%; WLC: $n = 32$, 32%), $\chi^2(1) = 25.92$, $p < 0.001$, NNT: 2.78, 95% CI [2.04, 4.33], and the SIAS (IG: $n = 60$, 60%; WLC: $n = 24$, 24%), $\chi^2(1) = 26.60$, $p < 0.001$, NNT: 2.78, 95% CI [2.05, 4.30].

Compared with WLC, more participants in the IG met the symptom-free criterion at T1 (IG: $n = 43$, 43%; WLC: $n = 19$, 19%), $\chi^2(1) = 13.46$, $p = 0.0155$, NNT = 4.17, 95% CI [2.75, 8.61], on both the SPS and the SIAS (IG: $n = 24$, 24%; WLC: $n = 11$, 11%), $\chi^2(1) = 5.85$, $p < 0.001$, NNT = 7.70, 95% CI [4.28, 38.12].

At T1, fewer participants in the IG showed reliable deterioration compared with those in the WLC based on both the SPS (IG: $n = 12$,

TABLE 2 Means and standard deviations for the IG and the WLC groups (ITT sample)

Outcome	T0		WLC		T1 ^a		WLC	
	IG	WLC	IG	WLC	IG	WLC	IG	WLC
	M	SD	M	SD	M	SD	M	SD
Primary outcome								
SPS	34.36	11.79	35.71	13.54	21.03	11.54	30.63	13.72
SIAS	51.47	11.23	48.71	12.92	36.72	13.86	44.36	14.05
Secondary outcome								
BDI-II	12.68	8.23	12.97	7.71	8.12	6.71	11.88	8.16
BSI	0.86	0.49	0.92	0.56	0.56	0.40	0.81	0.57
LSAS	77.61	16.87	76.96	19.57	58.82	20.45	72.51	22.17
IIP-64	1.71	0.39	1.66	0.43	1.34	0.47	1.5	0.48
FPES	43.82	11.00	39.90	13.00	36.17	13.49	39.95	14.6
DPSOS-Self	16.76	4.91	15.85	5.68	14.35	5.42	16.06	5.89
DPSOS-Others	42.51	11.93	40.16	12.56	36.11	14.81	40.60	14.81
AQoL	0.57	0.14	0.58	0.17	0.68	0.16	0.61	0.18
CSQ-8	—	—	—	—	25.15	3.77	—	—

Note. M: means; SD: standard deviations; IG: intervention group; WLC: waitlist control group; ITT: intention-to-treat; SPS: Social Phobia Scale; SIAS: Social Interaction Anxiety Scale; BDI-II: Beck Depression Inventory II; BSI: Brief Symptom Inventory; LSAS: Liebowitz Social Anxiety Scale; IIP-64: Inventory of Interpersonal Problems; FPES: Fear of Positive Evaluation Scale; DPSOS: Disqualification of Positive Social Outcomes Scale; AQoL: Assessment of Quality of Life; CSQ-8: Client Satisfaction Questionnaire.

^aMissing data imputed by multiple imputation.

12%; WLC: $n = 20$, 20%), $\chi^2(1) = 2.38$, $p = 0.12$, and the SIAS (IG: $n = 10$, 10%; WLC: $n = 18$, 18%), $\chi^2(1) = 2.66$, $p = 0.10$, although these differences did not reach statistical significance.

and quality of life. The ANCOVAs showed significant between-group effects on all outcomes at the postassessment point, with effect sizes ranging from $d = 0.27$ (95% CI [0.01, 0.55]) for the FPES to $d = 0.64$ (95% CI [0.36, 0.92]) for the Liebowitz Social Anxiety Scale.

3.4 | Secondary outcome analyses

Table 3 shows the results of the ITT analyses for the secondary outcomes, interpersonal problems, depression, somatic symptoms, FPE,

3.4.1 | Client satisfaction

Client satisfaction with the training was high, as 83% of the participants ($n = 70$) were “very or mostly satisfied” in general. Most of the

TABLE 3 Results of the ANCOVAs and Cohen's d for the primary and secondary outcome measures (ITT sample) at posttest (T1)

Outcome	T1 between-groups effect		ANCOVA ^a		T1 within-group effect
	d (95% CI)		$F(1, 197)$	p	
Primary outcome					
SIAS	0.55 [0.83, 0.27]		46.22	<0.001	1.17 [0.87, 1.47]
SPS	0.76 [0.47, 1.04]		40.30	<0.001	1.14 [0.84, 1.44]
Secondary outcome					
BDI-II	0.50 [0.22, 0.78]		16.77	<0.001	0.61 [0.32, 0.89]
BSI	0.49 [0.21, 0.77]		16.66	<0.001	0.66 [0.37, 0.94]
LSAS	0.64 [0.36, 0.92]		15.71	<0.001	1.00 [0.70, 1.29]
IIP-64	0.34 [0.06, 0.61]		16.55	<0.001	0.86 [0.56, 1.14]
FPES	0.27 [0.01, 0.55]		16.66	<0.001	0.62 [0.34, 0.90]
DPSOS-Self	0.30 [0.02, 0.58]		12.56	<0.001	0.47 [0.18, 0.74]
DPSOS-Others	0.30 [0.02, 0.58]		12.58	<0.001	0.48 [0.19, 0.75]
AQoL	0.41 [0.13, 0.69]		19.45	<0.001	0.73 [0.44, 1.01]

Note. ANCOVA: analysis of covariance; ITT: intention-to-treat; SPS: Social Phobia Scale; SIAS: Social Interaction Anxiety Scale; BDI-II: Beck Depression Inventory II; BSI: Brief Symptom Inventory; LSAS: Liebowitz Social Anxiety Scale; IIP-64: Inventory of Interpersonal Problems; FPES: Fear of Positive Evaluation Scale; DPSOS: Disqualification of Positive Social Outcomes Scale; AQoL: Assessment of Quality of Life.

^aControlling for pretreatment scores (T0).

participants in the IG group (82%, $n = 69$) rated the quality of the training as being “good” or “excellent.” The majority of the participants indicated that the training met “almost all” or “most” of their needs (79%, $n = 66$) and that they have received the kind of training they wanted (80%, $n = 67$; “yes, definitely” or “yes, generally”). Overall, they were satisfied with the amount of training they received (83%, $n = 70$; “very satisfied” or “mostly satisfied”), that the training has helped them “a great deal” or at least “helped” to deal more effectively with their problems (82%, $n = 69$), and that they would use the training again if needed (83%, $n = 70$; “yes, definitely” or “yes, I think so”). In closing, 88% ($n = 74$) of the participants would recommend the IMI to a friend (“yes, definitely” or “yes, I think so”).

3.4.2 | Sensitivity analyses

Results of the study completers, including only those participants that provided data, were very similar to those of the ITT analysis, with significant effects on all assessed outcomes and effect sizes at least as large as in the ITT analysis for all outcomes. The between-group effects were smallest for FPES ($d = 0.25$, 95% CI [-0.03, 0.53]) and highest for SPS ($d = 0.72$, 95% CI [0.43, 1.02]).

4 | DISCUSSION

This study evaluated the efficacy of an internet-based unguided self-help intervention for university students with SAD. We found moderate to large effects on social anxiety symptoms for the IG compared with the WLC. The intervention also showed significant effects on all secondary outcome measures including FPE, depression, and quality of life, thus providing evidence for unguided internet-based self-help as an effective format to treat SAD in university students.

The effects found in the present study are in line with the few previous studies targeting SAD symptoms in university students. The only other study on unguided self-help in a sample of students with a confirmed SAD diagnoses and fear of public speaking found significant effects compared with a WLC (Botella et al., 2010). A small pilot study ($N = 38$) on therapist guided self-help found comparable effects for changes in SAD on the SPS ($d = 1.18$ vs. 1.14 in the present study) but somewhat smaller effects with regard to changes on the SIAS ($d = 0.81$ vs. $d = 1.17$ in the present study; Tillfors et al., 2008). Recently, McCall et al. (2018) reported somewhat smaller within-group changes for unguided self-help in a non-clinical student sample with SAD symptoms (SIAS: $d = 0.72$), where between-group effects were comparable with the present study ($d = 0.56$). However, the authors reported completer data only, and the dropout rate in the study was substantial (>35%).

Furthermore, the findings are in concordance with those found for unguided internet-based self-help for SAD in general population samples. The latest meta-analysis on this topic found an average effect of $g = 0.78$ (95% CI [0.50, 1.05]; Kampmann et al., 2016), but with substantial heterogeneity between studies. Effects ($d = 1.14$ – 1.17 , 95% CI [0.84, 1.46]) are also in the range of what is typically found for state-of-the-art face-to-face CBT for SAD (Bandelow et al., 2015; $d = 1.10$, 95% CI [0.93, 1.28]).

Comparing effects on FPE with previous studies is not possible, as we are not aware of any other study that evaluated an intervention that directly targeted FPE. However, Weeks and colleagues reported large pre–post effects for face-to-face CBT that were not specifically targeting FPE. They found a reduction in FPE scores from baseline to posttreatment with a corresponding effect size of $d = 1.38$ (95% CI [1.24, 1.52]) compared with 0.62 (95% CI [0.34, 0.90]) in the present study. As we did not include a comparison condition without a module on FPE, it is not possible to conclude whether the additional FPE module had any incremental effect to the standard treatment, which should be tested in future studies.

Another important finding is that one third (34.5%) of the participants indicated that they would not be willing to utilize traditional available treatment formats such as face-to-face psychotherapy, further highlighting the potential of internet-based treatments for reaching people who were previously not reached by the current health care system (Ebert, Van Daele, et al., 2018a). This finding is in line with studies on barriers of treatment utilization in university students that found attitudinal barriers, such as a preference for self-help or fear of stigma, to be more relevant than structural barriers, such as non-availability, high costs, or long waiting times, in both university students (Ebert, Mortier, et al., 2018) and general population samples (Andrade et al., 2014).

The study has a number of limitations: First, common in randomized trials, there were a small number of cases that did not provide data at follow-up. However, missing data were handled using multiple imputations, and dropout was very low (IG: 9% and CG: 6% after 10 weeks). Therefore, it is unlikely that this has biased the results.

Second, one needs to keep in mind that the evidence provided by the present study is based on a randomized controlled trial (RCT) that is typically characterized by high structuring of participants and a high research attention. As the securing of participants' commitment represents an adherence-promoting element in self-help interventions, it may be the case that the effect sizes are an overestimation of what can be expected when implementing such an intervention into routine care. Hence, a clear concept for ensuring adherence in unguided self-help under routine conditions, such as through minimal guidance, seems favorable (Ebert & Baumeister, 2017).

Third, the elaborated study inclusion process typical for an RCT (i.e., completion of two self-report assessments and sending of informed consent) might have led to the greater inclusion of above-average motivated students, than one could expect outside of the controlled research context. This is a common limitation of RCTs on psychological interventions but may have a particularly high impact on the results of trials on unguided interventions. As a result, the findings might not generalize to unguided self-help without such an inclusion process.

Fourth, although findings clearly indicate that unguided internet-based self-help can result in substantial benefits for students with SAD, it may very well be the case that students are less willing to participate in such a mental health intervention if no support from a health care professional is provided, compared with interventions that include professional guidance. As the effect of any intervention depends on the utilization of the target population, lower overall effects at population level would result, if this should be the case.

Thus, future studies should compare the acceptability of different guidance formats as well as the comparable effects at population level.

Finally, a WLC design with unrestricted access to treatment as usual has been chosen, which may cause some participants in the control condition being less motivated to initiate health-related behavior changes and thus may overaccentuate effects (Ebert & Baumeister, 2017). Finally, follow-up of the results at 6 months will provide information about the sustainability of our internet-based approach.

This study demonstrated that StudiCare SAD is effective in treating SAD when compared with a waitlist control condition. Given the barriers of treatment utilization and high number of untreated university students, it would be worthwhile to integrate such IMIs into routine university health care. Future studies should focus on evaluating effects under routine care conditions.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the contribution of all participants, research assistants, therapists, and all others who contributed to our study.

FUNDING

This study is cofunded by the BARMER, a German statutory health insurance company. The funders did not have a role in study design, data collection, analysis, interpretation of results, or the decision to publish the study results.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved on 13.09.2016 by the Ethics Committee of the Friedrich-Alexander-Universität Erlangen-Nürnberg (ref. no. 260_16 B, 13.09.2016). A written consent was obtained by all participants.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIAL

The dataset used in the present study is available from DDE.

DECLARATION OF INTEREST STATEMENT

D. D. E. reports to have received consultancy fees or served in the scientific advisory board from several companies such as Minddistrict, Sanofi, Lantern, Schön Kliniken, German health insurance companies (BARMER and Techniker Krankenkasse), and chambers of psychotherapists. D. D. E. and M. B. are also stakeholders of the Institute for health trainings online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care. H. B. reports to have received consultancy fees and fees for lectures or workshops from chambers of psychotherapists and training institutes for psychotherapists. In the past 3 years, R. C. K. received support for his epidemiological studies from Sanofi Aventis, was a consultant for Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, and Takeda, and served on an advisory board for the Johnson & Johnson Services, Inc., and Lake Nona Life Project.

R. C. K. is a co-owner of DataStat, Inc., a market research firm that carries out health care research.

AUTHORS' CONTRIBUTIONS

D. D. E. and H. B. obtained funding for this study. F. K., D. D. E., T. B., and A. S. have contributed to the study design. F. K. drafted the manuscript, supervised by D. D. E. All authors contributed to the further writing of the manuscript and interpretation of data. All authors read and approved the final manuscript.

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How to cite this article: Kählke F, Berger T, Schulz A, et al. Efficacy of an unguided internet-based self-help intervention for social anxiety disorder in university students: A randomized controlled trial. *Int J Methods Psychiatr Res*. 2019;28:e1766. <https://doi.org/10.1002/mpr.1766>