

Acceptability and effectiveness of digital mental health and well-being support tailored for university students

Daniel Rivera, Nathan King, Charles Keown-Stoneman, Kristen Kyone, Emily Dephoure, Elizabeth Tetzlaff, Adeleine Lyon, Jonathan Kingslake, Kurtis Pankow, Edward Watkins, Anne Duffy

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Abstract

Background: Barriers to accessing mental health support are common experiences reported by university students. Digital tools can improve equitable access to the indicated level of support and provide actionable insight and recommendations.

Objective: This study aimed to evaluate the acceptability and effectiveness of a web-based self-guided mental health and well-being support platform (U-Flourish Platform) that was tailored specifically for university students.

Methods: The i-spero® platform was adapted in partnership with students to provide evidence-based well-being plans, mental health symptom tracking, and automated alerts and recommendations based on self-report data from students. After providing informed consent, students registered to access the platform and completed baseline demographic information and weekly validated screening measures of anxiety (GAD), depression (PHQ), and well-being (SWEMWEBS) over 8 weeks. At 6 weeks, students completed a user-experience survey. Paired t-tests were used to compare symptom scores and chi-squared tests assessed changes in symptom screening status over the 8-week period. Unadjusted logistic regression was used to assess whether baseline demographic factors and symptom screening status were associated with user-experience outcomes.

Results: The analyses included data from 404 consenting students. At 6-weeks, most students (75%) expressed satisfaction with the platform, felt it was easy to use and understand (85%), and found the platform helpful for supporting their mental health (58%). Adherence was relatively high (76%) and attrition was relatively low (26%) after 6 weeks but reduced substantively thereafter; associated with timing of the end of incentivized use and end of term examinations and assignments. Mean anxiety (1.55 vs. 2.19, $p<.0001$; Cohen's $d=0.36$), depression (0.94 vs. 1.36, $P=.0001$; Cohen's $d=0.33$), and well-being (24.87 vs. 22.28, $P<.0001$, Cohen's $d=0.34$) scores were improved at 8-Weeks vs baseline, with the greatest positive effects for students who screened positive for anxiety (Cohen's $d=1.16$) and depression (Cohen's $d=2.22$) at baseline. There was no evidence of differences in user-experience across demographic factors (i.e. gender, international student status, and lifetime history of a mental disorder) or baseline screening status, except for males who had lower odds (OR=0.40, 95% CI: 0.18-0.90) of finding the

platform easy to use compared to female students. Of the 404 student-users, 142 created at least one well-being plan, with 75% and 57% of them being endorsed as helpful and being satisfactory in the support they provided, respectively. Most students reported satisfaction with the Platform (75%), it being easy to use (85%), and it having a positive impact on their mental health (58%).

Conclusions: Evidence supports that a self-guided digital well-being and mental health support platform is an acceptable and useful resource for university students. Therefore, student-tailored digital tools should be considered as part of an integrated and comprehensive whole-university approach for student well-being and mental health support.

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Original Manuscript

Original Paper

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Abstract

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Conclusion: Evidence supports that a self-guided digital well-being and mental health support platform is an acceptable and useful resource for university students. Therefore, student-tailored digital tools should be considered as part of an integrated and comprehensive whole-university approach for student well-being and mental health support.

Keywords: Mental health; Students; Universities; Digital health; Web-Based Intervention; Self-management; Anxiety disorders; Depression; Psychological Well-Being; User experience

Introduction

Common mental disorders such as anxiety and depression have increased over the past two decades in young people aged 16 to 25 years, including in the university student population [1]. University

students face unique academic, social, and environmental challenges [2] at a time of substantive brain and biopsychosocial development [3, 4] and coinciding with the peak period of risk for psychiatric disorder onset [1]. Reports suggest 31% of post-secondary students experience clinically significant symptom levels for at least one common mental disorder [5] and as many as 60% of post-secondary students report at least some perception of experiencing mental health challenges [6]. Moreover, as diversity of the student population has grown, more marginalized students and those from historically underrepresented backgrounds are entering higher education and may be at an even higher risk for reduced well-being related to mental health difficulties [6, 7]. Increases in mental health concerns among students and in university enrolment are straining university mental health support resources [1]. At the same time, community mental health resources have long wait times and are not organized to support common mental disorders or sub-threshold symptoms, which are the most prevalent concerns in help-seeking university students [6].

Historically, universities have focused on a combination of wellness promotion and reactive short-term or crisis-focused mental health support through a series of often fragmented initiatives and services that are not systematically integrated or rationalized to meet the indicated needs of individual students [8, 9]. Further, students report uncertainty of when to seek help and difficulty navigating the confusing array of support offered [10]. Students have expressed a priority need for more timely and accessible well-being and mental health supports that are tailored to address their specific needs [10].

Digital tools are increasingly recognized as a key player in the delivery of sustainable, personalized, and integrated well-being and mental health support [11, 12]. These tools can provide individualized recommendations to students that map onto available supports, ready access to effective self-guided resources, and mental health symptom monitoring that could be shared across services and support rationalized or stepped care [13]. Digital mental health interventions have generally been found to be acceptable, with some evidence of effectiveness at reducing symptoms and psychological distress in higher education students [14] and high-risk young adult populations [12]. While self-guided digital mental health interventions (DMHIs) are increasingly being offered as part of a menu of student mental health support, these resources have largely not been co-produced with students, tailored specifically for this population, nor rigorously evaluated in the university setting.

In this large longitudinal prospective study, we report on the acceptability and effectiveness of a novel web-based well-being and mental health support platform, specifically developed in partnership with and customized for university students. The platform can be used to set well-being goals, monitor well-being and mental health symptom levels, support pro-health behavioural change, and provide personalized feedback and recommendations based on the individual data shared by students.

Methods

Study design

The web-based U-Flourish Platform was adapted from the i-spero® Platform [15]. The i-spero® Platform was originally designed to support improvement in time to recovery from depression for patients treated in primary care in the UK [16]. The U-Flourish Platform content and interface was designed in collaboration with students and based on their iterative feedback during pilot testing [17]. Core functionality of the platform included: guided well-being planning and goal setting, self-monitoring using brief validated measures, automated feedback in student-friendly language, and advice about further resources dependent on reported symptom levels and screening thresholds [17].

Undergraduate students attending Queen's University (Canada) were eligible to participate in the current study. Participants were recruited from the general student body through digital and in-person student awareness events [17, 18] and as part of an optional learning activity for undergraduates enrolled in an accredited mental health literacy course [19]. Participating students from the general student body were offered a \$5 coffee gift card and entry into a draw for 1 of 5 iPads for using the U-Flourish Platform and completing measures at least up to 6 weeks. Students recruited through the course were offered 5% towards their overall grade for using the platform for at least 6 weeks as part of a course learning assignment. Interested students were provided with a link to the U-Flourish Platform and after reading a Letter of Information registered and provided electronic consent to participate in the study [18]. All student data was entered and stored on the U-Flourish Platform. Participants completed a brief baseline questionnaire that collected demographic information and validated mental health and well-being screening measures. Participants were also prompted to complete brief weekly core measures for 8 weeks and a user-experience survey (Experience Survey) at 6 weeks [17].

The study protocol, Letter of Information, and all student facing materials were reviewed for ethical compliance by Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board (HSREB) (PSIY-739-22).

Study sample

The final sample consisted of 404 undergraduate students who registered, provided consent to participate, and completed baseline screening measures between January 2024 to August 2024. Participant demographic data (Table 1) was collected via the platform or obtained through data linkage to the U-Flourish Well-Being Survey study database if students indicated having already provided such data in a previous U-Flourish Survey as part of an on-going cohort study at Queen's University (HSREB PSIY-739-22).

Study measures

Demographics

Participants self-reported their age in years at the time of signup, gender, ethnicity, domestic or international student status, and lifetime history of a mental disorder were self-reported by participants from pre-defined drop-down lists during completion of the baseline survey in the platform or a prior U-Flourish Survey [18]. Ethnicity response options were adapted from the 2016 Statistics Canada ethnicity categories. Response options for gender were as follows: male, female,

non-binary, prefer to self-describe (free text entry permitted), prefer not to say.

Indicators of mental health and well-being

As summarized in Table 2, brief validated screening measures were used. Core baseline and weekly measures included the GAD-2 [20] and PHQ-2 [21, 22] and the 7-item Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) [23]. If screen positive score thresholds were reached (≥ 3 GAD-2 and PHQ-2), students were prompted to complete the full screening measure (i.e., GAD-7, PHQ-9). A score of ≥ 10 on both the PHQ-9 [21] and GAD-7 [20] were indicative of clinically significant depressive or anxiety symptoms (screen positive), respectively. A SWEMWBS score of ≤ 19 was indicative of low well-being (screen positive) [24].

Platform acceptability was primarily evaluated from student responses on the 6-Week Experience Survey and secondarily from passively collected data pertaining to platform use (i.e., weekly completion of core screening measures, cessation of platform use, and number of sign-ins). On the Experience Survey students ranked their satisfaction with the platform; ease of use of the platform; and the platform's impact on their mental health, well-being, studies; ability to self-monitor and understand their feelings; and knowledge of when to seek help. Questions were framed as positive statements (e.g. "Overall, I was satisfied with the U-Flourish Platform") and students were asked to select their level of agreement (e.g., strongly agree, agree, neutral, disagree, strongly disagree). Students were also invited to respond in free text format to the question: "Do you have any thoughts/comments you would like to share about the U-Flourish Platform that might help us develop this resource to benefit other students".

Weekly completion of the core, mandatory screening measures (e.g., GAD-2 and PHQ-2) was considered an indicator of ongoing use. The number of sign-ins to the platform was also collected for all participants. Students who self-reported they were no longer using the platform on the Experience Survey were asked to select their reasons for discontinuation from a pre-defined list with the option to describe other reasons via free text.

Engagement with well-being plans

The U-Flourish Platform suggested well-being plans to students based on their self-reported symptom levels. Student engagement with well-being plans was estimated from the total number of well-being plans created (overall and average per student), the frequency that specific plans and well-being activities associated with the plans (minimum one activity per plan) were selected, and the number of "actions" selected which students could optionally create to define specific steps necessary to accomplish a chosen activity (e.g., "call to book student health appointment"). Well-being plans were organized by target concern (e.g., boosting your mood, improving your sleep, managing stress and anxiety) and required students to select a specific resource or activity (well-being activity) from a predefined list. Upon well-being plan selection, students were provided with general guidance and links to specific information about suggested activities, resources, or well-being practices that they could engage with online or on campus (e.g., campus peer-support sessions). Students were prompted to rate their satisfaction with the help they received from the plan after 4-weeks (ranging from strongly agree to strongly disagree). Students also rated how helpful the well-being plan was for their target problem(s) (made things a lot better, made things somewhat better, made no difference, made things somewhat worse, or made things a lot worse).

Analysis

SAS Version 9.4 (SAS Institute, Cary NC) was used for all statistical analyses. Student demographics, lifetime history of mental disorder, and international student status were collected. Descriptive statistics were used to summarize baseline and weekly PHQ-2, GAD-2, and SWEMWBS scores, including the proportion of students screening positive, the number of platform log-ins, well-being plans created, well-being actions added, user-experience measures, and well-being plan ratings.

To assess changes in mean symptom levels, paired t-tests were performed on baseline and 8-Week PHQ-2, GAD-2, and SWEMWBS total score data. Effect sizes were calculated by Cohen's d statistics and interpreted as per Cohen (25). Additionally, paired t-tests were used to compare the symptom scores in students who screened positive or negative at baseline. For the subset of students prompted to complete full measures, comparisons were made between baseline and 6-Weeks, given low completion rates of GAD-7 and/or PHQ-9 at 8-Weeks. The proportions of students whose PHQ-2, GAD-2, and SWEMWBS screening status improved (i.e. positive to negative) was compared to the proportions of students whose screening status worsened (i.e. negative to positive) or did not change between baseline and Week 8 via McNemar's tests or chi-square tests, respectively.

Unadjusted binomial logistic regression was used to estimate odds ratios and associated 95% CIs examining whether demographic factors and baseline screening status was associated with student satisfaction with the Platform, ease of use, and adherence based on completion of the PHQ-2 at 6-Weeks.

Free text responses to the 6-Week UES question "*Do you have any thoughts or comments you would like to share about the well-being platform that might help us develop this resource to benefit other students*" were analyzed using the Framework Method [26, 27]. Briefly, two reviewers familiarized themselves with the verbatim free text responses and independently and inductively developed codes based on primary response themes. Codes were indexed into columns for all responses for comparison, then major patterns and themes were assessed. Both reviewers, who were undergraduate students, met after 10 responses were coded to compare initial coding, discuss discrepancies, and consolidate redundant and merge overlapping codes for the purpose of establishing a working framework. Reviewers repeated this process to refine the framework until they felt it was adequately descriptive of the user experiences. Results were discussed, interpreted, and summarized by these reviewers in consultation with the first author.

Results

Description of student demographics and baseline mental health

In total, 404 students consented, registered, and completed a baseline assessment (Table 1). Most students indicated that they opted to use the U-Flourish Platform as part of an optional accredited assignment in an undergraduate mental health literacy course (96.8%), were between 19 and 21 years old (66.5%), female (70.1%), self-described as white (57.3%) or Asian (31.5%), and domestic students (94.6%). Over one-third of students reported a lifetime history of a mental disorder (36.9%) with the most common diagnoses being anxiety, mood, eating and sleep disorders and learning disabilities.

Table 1. Description of students who registered for i-spero (n=404).^a

	n	(%)
Estimated age at signup, years		
≤18	56	(16.9)
19	60	(18.1)
20	73	(22.1)
21	87	(26.3)
≥22	55	(16.6)
Gender		
Female	232	(70.1)
Male	91	(27.5)
Non-binary	6	(1.8)
Prefer not to say	2	(0.6)
Ethnicity		
White	189	(57.3)
Asian	104	(31.5)
Black	9	(2.7)
Other/Multiple	27	(8.2)
Prefer not to say	1	(0.3)
International student		
No	313	(94.6)
Yes	16	(4.8)
Prefer not to say	2	(0.6)
Lifetime History of Mental Illness		
Yes, Any	149	(36.9)
Anxiety disorder	114	(28.2)
Mood disorder	83	(20.5)
Learning disability	55	(13.6)
Eating disorder	35	(8.7)
Sleep disorder	19	(4.7)
Substance disorder	7	(1.7)
Psychotic disorder	3	(0.74)
Other	9	(2.2)

	<i>Multiple</i>	100	(24.8)
	No	255	(63.1)
Completed the Mental Health Literacy Course			
	Yes	334	(96.8)
	No	11	(3.2)

^aMissing data ranges from 0.0% to 18.3%.

Baseline screening status and symptom scores for participants are described in Table 2. About one-third (35.1%) of students screened positive for on the GAD-2, while about one-fifth (20.3%) of students screened positive on the PHQ-2. Mean scores on the GAD-2 and PHQ-2 were below the screen positive threshold. The mean well-being score for students was 22.7 ± 4.4 , which was above the SWEMWBS threshold for low-wellbeing, and about one-fifth (20.3%) of students met the screening threshold for low well-being.

Table 2. Baseline screening scores for anxiety, depression, and well-being.

	n	Symptom Score		Screen Positives	
		Mean	(SD)	n Yes	(% Yes)
<i>Anxiety – GAD-2</i>	404	2.4	(1.7)	142	(35.1)
<i>Depression – PHQ-2</i>	404	1.5	(1.3)	82	(20.3)
<i>Well-being – SWEMWBS</i>	404	22.7	(4.4)	82	(20.3)

Acceptability of the student well-being platform

Adherence was assessed by completion rates of core weekly questionnaires over 8 weeks (n=404). As seen in Figure 1, there was a 24% drop in adherence after baseline, stabilization from Weeks 1-6, and significant decline between 6 and 8 weeks. At Week 8, only 140 (34.7%) students completed the core GAD-2 and PHQ-2 measures (Figure 1). Attrition from the study, defined as when students stopped completing core measures for the remainder of the 8 weeks, was 15.0% at Week 1 and 26.0% at Week 6 and increased thereafter (Figure 2). Reasons for discontinuing use was only provided by a small subset of student users in the Experience Survey (n=25) and most frequently included that the platform did not suit their needs, students didn't have time for it, or that the platform was not helping them. The mean number of logins was 10.6 ± 9.5 per student and ranged from 1-63 over the 8 weeks.

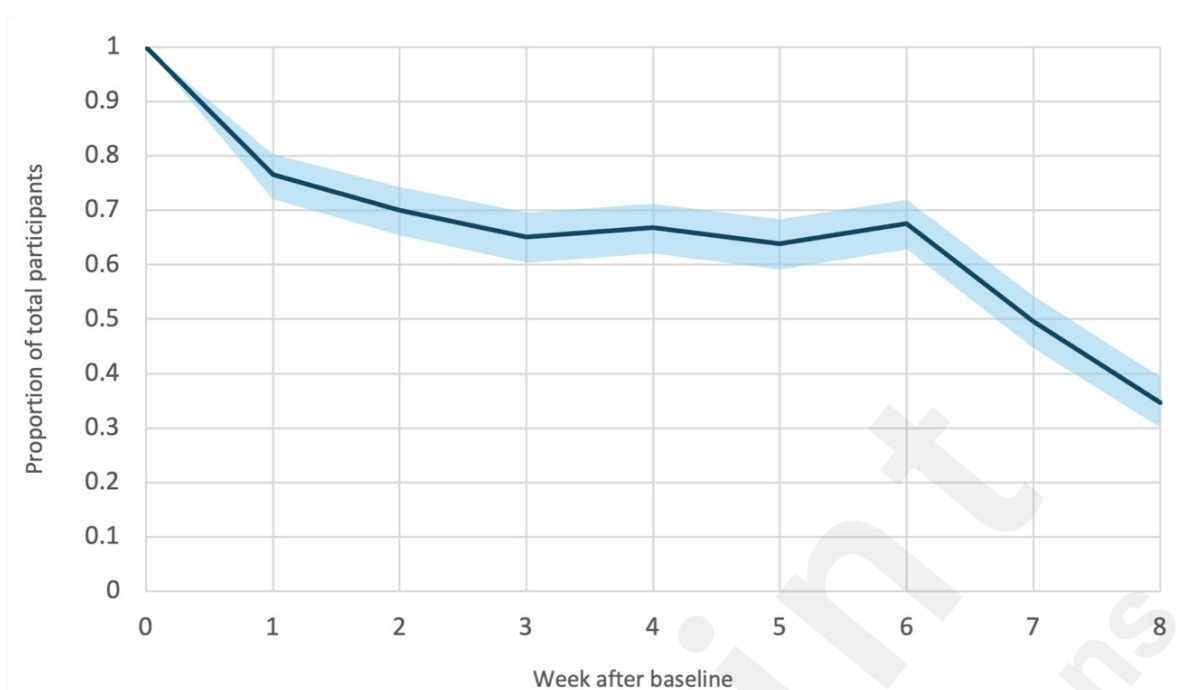


Figure 1. Adherence to mandatory symptom screening measures over 8 weeks (n=404). Adherence was defined as having completed the weekly PHQ-2 or GAD-2 screening questionnaires and was expressed as the proportion of the total number of students who registered for i-spero and completed a baseline questionnaire (n=404). 95% confidence intervals were calculated using Wilson's score approach and are represented by the shaded area.

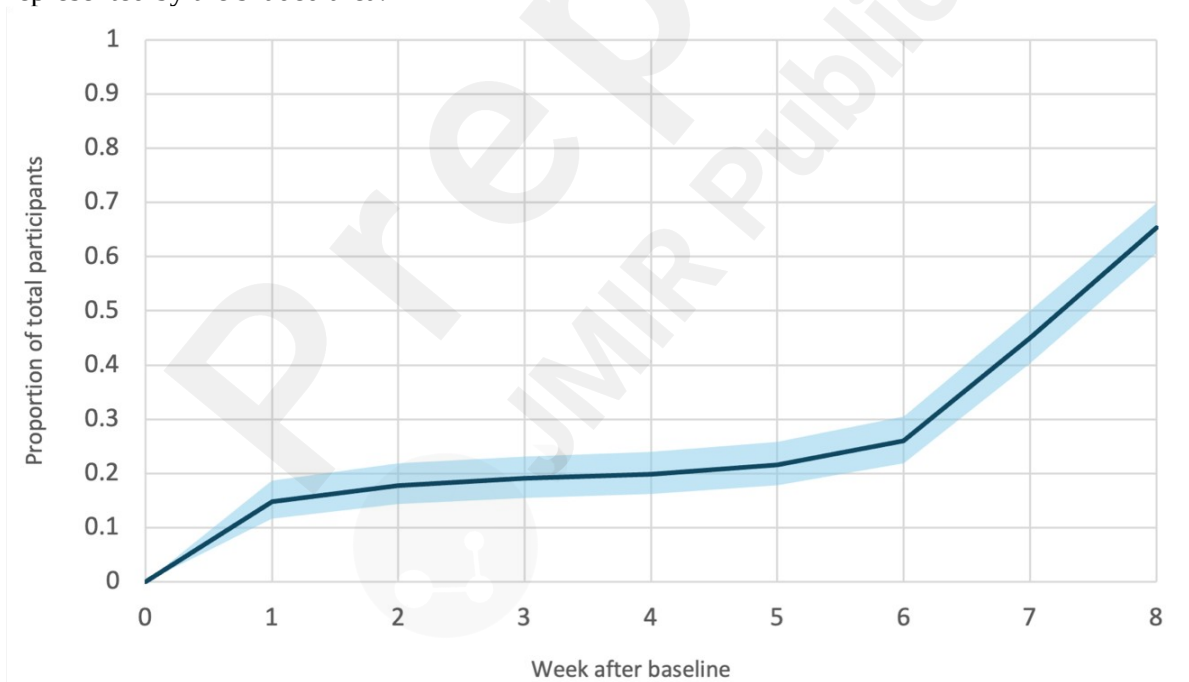


Figure 2. Attrition from platform use over 8 weeks. Weekly cumulative attrition was described as the proportion of students who registered for i-spero and completed the baseline questionnaire (n=404) that ceased completing the PHQ-2 or GAD-2 screening measures for the remaining 8 weeks. 95% confidence intervals were calculated using Wilson's score approach and are represented by the shaded area.

Generally, students reported high ease of use and overall satisfaction with the U-Flourish Platform at 6-Weeks (Table 3). Most students strongly agreed (41.9%), agreed (43.3%) or were neutral (10.5%) regarding the platform being easy to use and understand, while 19.5% strongly agreed, 55.2% agreed, and 21.3% were neutral about being satisfied with the platform. Further, 57% of students

found that the platform had a positive or very positive impact on their mental health (41.9% neutral, 0.4% negative). The majority of students agreed or strongly agreed that the platform helped them understand how they were feeling (74.4%), monitor and manage their well-being goals (72.2%), and know when to reach out for additional support (56%). In addition, 41.9% agreed that the platform helped them find the right resources and services (41.9% neutral, 13.7% disagree, 2.5% strongly disagree) (Table 3). Students who completed mandatory core-screening at 6-Weeks along with the Experience Survey, were not significantly different from the full baseline sample, based on age, gender, ethnicity, international student status, and lifetime history of a mental disorder (Supplemental Table 2).

Table 3. Student impressions of the i-spero platform from the 6-week student experience survey.^{a,b}

	Strongly agree/ Very positive ^b	Agree/ Positive ^b	Neutral	Disagree/ Negative ^b	Strongly disagree/ Very negative ^b
Statement	n (row%)				
<i>It was easy to use and understand</i>	116 (41.9)	120 (43.3)	29 (10.5)	8 (2.9)	4 (1.4)
<i>It helped me to monitor and manage my own well-being goals</i>	44 (15.9)	156 (56.3)	66 (23.8)	11 (4.0)	0 (0.0)
<i>It helped me better understand how I was feeling</i>	64 (23.1)	142 (51.3)	52 (18.8)	18 (6.5)	1 (0.4)
<i>It helped me know when I needed to reach out for additional support</i>	36 (13.0)	119 (43.0)	97 (35.0)	24 (8.7)	1 (0.3)
<i>It helped me find the right resources and services</i>	25 (9.0)	91 (32.9)	116 (41.9)	38 (13.7)	7 (2.5)
<i>I would recommend to a friend</i>	31 (11.2)	130 (46.9)	80 (28.9)	31 (11.2)	2 (0.7)
<i>Overall, I was satisfied with it</i>	54 (19.5)	153 (55.2)	59 (21.3)	11 (4.0)	0 (0.0)
<i>What impact has the U-Flourish i-spero tool had on your mental health and well-being?^b</i>	41 (14.8)	119 (43.0)	116 (41.9)	1 (0.4)	0 (0.0)
<i>What impact has the U-Flourish i-spero tool had on your studies?^b</i>	30 (10.8)	97 (35.0)	148 (53.4)	1 (0.4)	1 (0.4)

^an missing=145.

^bPositive and negative ratings apply specifically to statements around impact.

Demographic characteristics (i.e., gender, international student status, and lifetime history of a mental disorder) were, broadly not associated with ease of use, satisfaction, or completion of mandatory screening at Week 6 (Table 4). However, male students had lower odds (OR=0.40, 95% CI: 0.18-0.90) of finding the platform easy to use compared to female students. Further, students who screened positive on the PHQ-2 at baseline had higher odds (OR=3.67, 95% CI: 1.09-12.36) of finding the platform easy to use compared to those who screened negative at baseline.

Table 4. Associations between baseline demographic factors and user experience outcomes (ease of use, satisfaction, and adherence).

	n	n reporting	n reporting	OR (95% CI)	P
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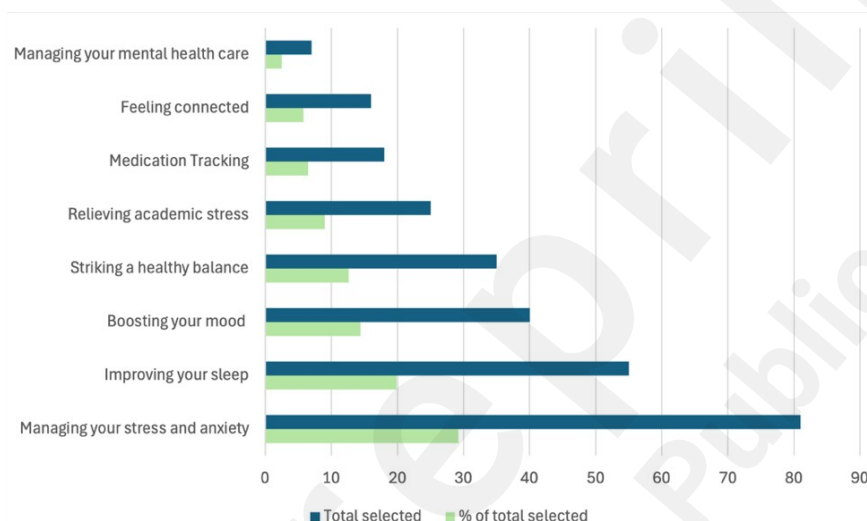
		'yes' for demographic factor (% reporting outcome)	'no' demographic factor (% reporting outcome)		
Demographic factor – Yes (vs No)	<i>Found it easy to use (very strongly agree, agree)</i>				
Lifetime diagnosis – any (vs none)	277	102 (81.4)	175 (87.4)	0.63 (0.32-1.23)	0.17
Lifetime diagnosis – multiple (vs one or less)	277	70 (82.9)	207 (86.0)	0.79 (0.38-1.64)	0.52
Student status – domestic (vs other)	218	212 (87.7)	6 (66.7)	3.58 (0.62-20.51)	0.15
Gender – Male (vs female)	220	52 (76.9)	168 (89.3)	0.40 (0.18-0.90)	0.03
Positive baseline anxiety (GAD-2) screen	277	99 (82.8)	178 (86.5)	0.75 (0.38-1.48)	0.41
Positive baseline depression (PHQ-2) screen	277	56 (94.6)	221 (82.8)	3.67 (1.09-12.36)	0.04
	<i>Was satisfied (very strongly agree, agree)</i>				
Lifetime diagnosis – any (vs none)	277	102 (74.5)	175 (74.9)	0.98 (0.56-1.72)	0.95
Lifetime diagnosis – multiple (vs one or less)	277	70 (78.6)	207 (73.4)	1.33 (0.69-2.54)	0.39
Student status – domestic (vs international)	218	212 (76.4)	6 (76.4)	1.62 (0.29-9.11)	0.11
Gender – Male (vs female)	220	52 (67.3)	168 (78.0)	0.58 (0.29-1.15)	0.12
Positive baseline anxiety (GAD-2) screen	277	99 (77.8)	178 (73.0)	1.29 (0.73-2.30)	0.38
Positive baseline depression (PHQ-2) screen	277	56 (78.6)	221 (73.8)	1.31 (0.65-2.64)	0.46
	<i>Completed PHQ-2 at 6 weeks</i>				
Lifetime diagnosis – any (vs none)	404	154 (63.0)	176 (70.4)	0.72 (0.47-1.10)	0.12
Lifetime diagnosis – multiple (vs one or less)	404	100 (60.0)	304 (70.1)	0.64 (0.40-1.03)	0.06
Student status – domestic (vs other)	329	313 (67.1)	16 (56.3)	1.59 (0.57-4.38)	0.37
Gender – Male (vs female)	331	91 (71.4)	340 (64.6)	1.37 (0.81-2.32)	0.24
Positive baseline anxiety (GAD-2) screen	404	142 (66.9)	262 (67.9)	0.95 (0.62-1.47)	0.83
Positive baseline depression (PHQ-2) screen	404	82 (59.8)	322 (69.6)	0.65 (0.39-1.07)	0.09
Positive baseline anxiety (GAD-7) screen	143	96 (65.6)	47 (68.1)	0.90 (0.43-1.88)	0.77
Positive baseline depression (PHQ-9) screen	83	58 (55.2)	25 (72.0)	0.48 (0.17-1.27)	0.15

^aUnadjusted logistic regressions were used to estimate Odds Ratios (OR).

Well-being plans

Student use and experience of the well-being plan feature was described for all those who set up at least one plan on their platform (n=142 (35.1%)) (Supplemental Table 3). Among these 142 students, 277 well-being plans were created yielding a mean number of 2.0 ± 1.4 well-being plans per student. The most popular well-being plans selected were “*Managing your stress and anxiety*” (29.2%), “*Improving your sleep*” (19.9%), “*Boosting your mood*” (14.4%), and “*Striking a healthy balance*” (12.6%) (Figure 3, Supplemental Table 4). Well-being plans were associated with a well-being activity that students selected from a list, with the most popular being “*Physical activity*” (30.3%), “*Sleep plan*” (14.4%), “*Making a study plan*” (8.3%), and “*Mindfulness*” (7.2%) (Figure 3, Supplemental Table 4).

A) Well-being Plans



B) Well-being Activities

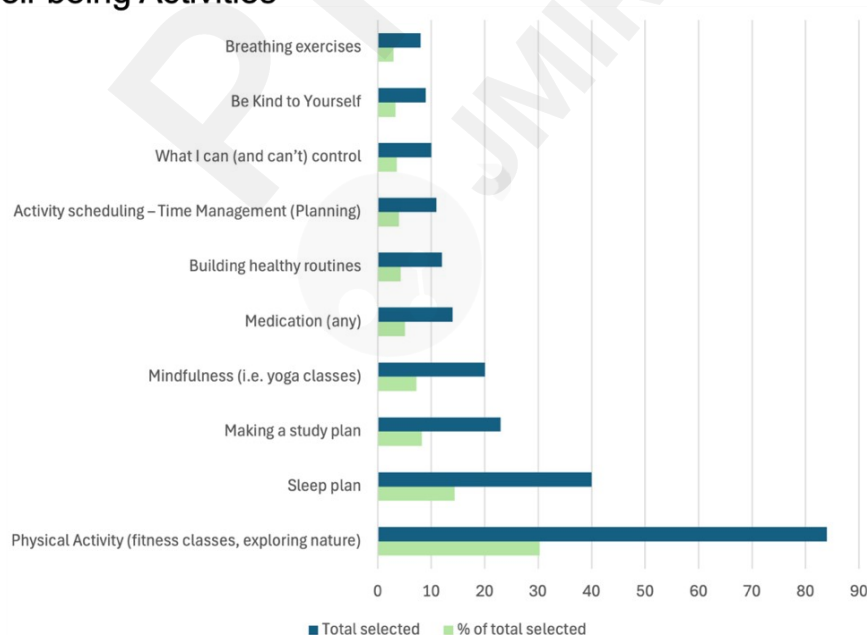


Figure 3. Student selection of well-being plans (Panel A) and associated activities (Panel B). Only activities selected ≥ 5 times are presented. n=277.

Overall, students reported that the well-being plans were helpful with targeting specific goals and/or problems and were satisfied with the plans (Table 5). Of the 255 students who provided well-being plan feedback, 74.9% found them to have “made things better”, 25.1% found it “made no difference”, and no students reported that the plans made things worse. The most helpful well-being plans included “*Feeling connected*”, “*Relieving academic stress*”, “*Striking a health balance*”, “*Managing your stress and anxiety*”, and “*Improving your sleep*”. Student satisfaction largely mirrored the student impressions of the well-being plans’ impact described above (Table 5).

Table 5. Perceived helpfulness of and satisfaction with the well-being plans reported by students responding to the 6-week student experience survey.^a

		Made things a lot better/ Strongly agree ^a	Made things somewhat better/ Agree ^a	Made no Difference/ Neutral ^a	Made things somewhat worse/ Disagree ^a	Made things a lot worse/ Strongly disagree ^a
	n	Proportion of users (%)				
<i>How much did this well-being plan help with your specific problem(s)?</i>						
Overall (All Plans)	251	21.1	53.8	25.1	0.0	0.0
Managing your stress and anxiety	70	18.6	55.7	25.7	0.0	0.0
Improving your sleep	51	21.6	51.0	27.5	0.0	0.0
Boosting your mood	36	25.0	47.2	27.8	0.0	0.0
Striking a healthy balance	31	9.7	67.4	22.6	0.0	0.0
Relieving academic stress	27	29.6	59.3	11.1	0.0	0.0
Medication	12	25.0	33.3	41.7	0.0	0.0
Feeling connected	12	33.3	58.3	8.3	0.0	0.0
Managing your Mental Health Care	9	22.2	44.4	33.3	0.0	0.0
Medical appointments	2	-	-	100.0	0.0	0.0
Psychological therapy	1	-	100	-	0.0	0.0
<i>Overall, I was satisfied with the help I received from this well-being plan</i>						
Overall (All Plans) ^a	251	12.8	44.2	34.3	3.2	5.6
Managing your stress and anxiety ^a	70	14.3	40.0	34.3	7.1	4.3
Improving your sleep ^a	51	17.7	51.0	27.5	2.0	2.0
Boosting your mood ^a	36	13.9	52.8	25.0	2.8	5.6
Striking a healthy balance ^a	31	3.2	58.1	32.3	3.2	3.2
Relieving academic stress ^a	27	7.4	26.0	55.6	-	11.1
Medication ^a	12	8.3	16.7	58.3	-	16.7
Feeling connected ^a	12	16.7	50.0	25.0	-	8.3

Managing your Mental Health Care ^a	9	22.2	55.6	11.1	-	11.1
Medical appointments ^a	2	-	-	100.0	-	-
Psychological therapy ^a	1	-	-	100.0	-	-

^aLevels of agreement apply specifically in response to the statement around satisfaction with the help received by specific well-being plans.

Free text responses on the user-experience survey

A total of 73 students provided free text responses distilled into 15 themes describing participants' experience using the U-Flourish Platform. These themes, along with their frequency, are described in Supplemental Table 5. Many students described having a positive experience engaging with the platform: "The i-Spero tool is great. I had an awesome experience!". In addition, students also described finding the platform beneficial in helping them self-manage their mental health: "This is a great tool for mental health management".

On the other hand, students also described where improvements could be made in technical functionality and in the comprehensiveness of well-being and symptom tracking, and how the platform could best help those actively struggling with mental health. Specifically, students' repeatedly expressed a preference for incorporating a live or interactive component to enhance engagement with the platform: "a way to focus more on interaction with a person, rather than a survey 'could be beneficial'; a perceived need for a diary-like feature to annotate well-being tracking results as some students felt that their results were more indicative of transient rather than persistent feelings; and the notion that the platform could be more beneficial for those with ongoing mental health challenges than those without them "[the platform] may be more beneficial to people who struggle with mental health, as I personally feel I have a very strong mental health and well-being [and] I did not really see the need to use this".

Platform effectiveness at supporting student well-being and mental health

Mean PHQ-2 depressive symptom total scores were lower at Week 8 compared to baseline for all students (0.94 ± 1.10 vs. 1.36 ± 1.26 , $P=.0001$) with a small-moderate effect size (Cohen's $d=0.33$) (Table 6). Students who screened positive at baseline had lower mean scores at Week 8 compared to baseline (1.48 ± 1.36 vs 3.62 ± 0.86 , $p<0.0001$; Cohen's $d=2.22$). There was no evidence of an 8-Week change in scores among students who screened negative at baseline ($P=.20$).

Mean GAD-2 anxiety symptom total scores were also lower at Week 8 compared to baseline for all students (1.55 ± 1.64 vs. 2.19 ± 1.62 , $p<.0001$; Cohen's $d= 0.36$), with a much larger decrease (effect size) in those who screened positive at baseline (2.39 ± 1.83 vs. 4.32 ± 1.11), $p<.0001$, Cohen's $d=1.16$) (Table 6). There was no evidence of differences between baseline and week 8 GAD-2 scores for students who screened negative at baseline ($P=.42$).

Mean well-being scores, as measured via the SWEMWBS, improved in all students using the platform and completing up to 8 weeks of data collection (Table 6), regardless of baseline well-being screening status.

Table 6. Paired t-test comparing average anxiety, depression, and well-being screening scores from baseline to week 8, overall and by baseline screening status.

	n	Baseline	8-Week	Mean	P	Cohen's d
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		mean (SD)	mean (SD)	difference (SD)		
PHQ-2 (Depression)	140	1.36 (1.26)	0.94 (1.10)	-0.42 (1.27)	0.0001	0.33
PHQ-2 – <i>positive at baseline</i>	21	3.62 (0.86)	1.48 (1.36)	-2.14 (0.96)	<0.0001	2.22
PHQ-2 – <i>negative at baseline</i>	119	0.97 (0.83)	0.84 (1.02)	-0.13 (1.07)	0.20	0.12
GAD-2 (Anxiety)	142	2.19 (1.62)	1.55 (1.64)	-0.63 (1.73)	<0.0001	0.36
GAD-2 – <i>positive at baseline</i>	41	4.32 (1.11)	2.39 (1.83)	-1.93 (1.66)	<0.0001	1.16
GAD-2 – <i>negative at baseline</i>	101	1.33 (0.78)	1.21 (1.43)	-0.12 (1.47)	0.42	0.08
SWEMWBS (Well-being)	141	23.28 (4.40)	24.87 (5.65)	1.59 (4.70)	<0.0001	0.34
SWEMWBS – <i>positive at baseline</i>	25	16.68 (2.14)	19.64 (5.61)	2.96 (6.76)	0.04	0.44
SWEMWBS – <i>negative at baseline</i>	116	24.71 (3.33)	26.00 (5.01)	1.29 (4.11)	0.001	0.31

The weekly proportions of students who screened positive on the PHQ-2, GAD-2 and SWEMWBS are depicted in Figure 4. Proportions of students with directional changes (improved, worsened, did not change) in PHQ-2, GAD-2, and SWEMWBS screening statuses from baseline to 8 weeks were compared in Table 7. The proportion of students who changed screening status from positive to negative (improved) was higher than the proportion of students who changed from negative to positive (worsened) on the PHQ-2 (90.5% vs. 4.2%, c^2 $P=0.0043$) and GAD-2 (68.3% vs. 10.9%, c^2 $P=.0065$) total score. No such differences were observed for SWEMWBS (baseline vs. week 8) screening statuses. The proportion of students who improved was found to be higher than the proportion that continued to screen positive at both time points (did not change) for the PHQ-2 (90.5% vs. 9.5%, c^2 $P=.0002$) and GAD-2 (68.3% vs. 31.7%, c^2 $P=.0191$).

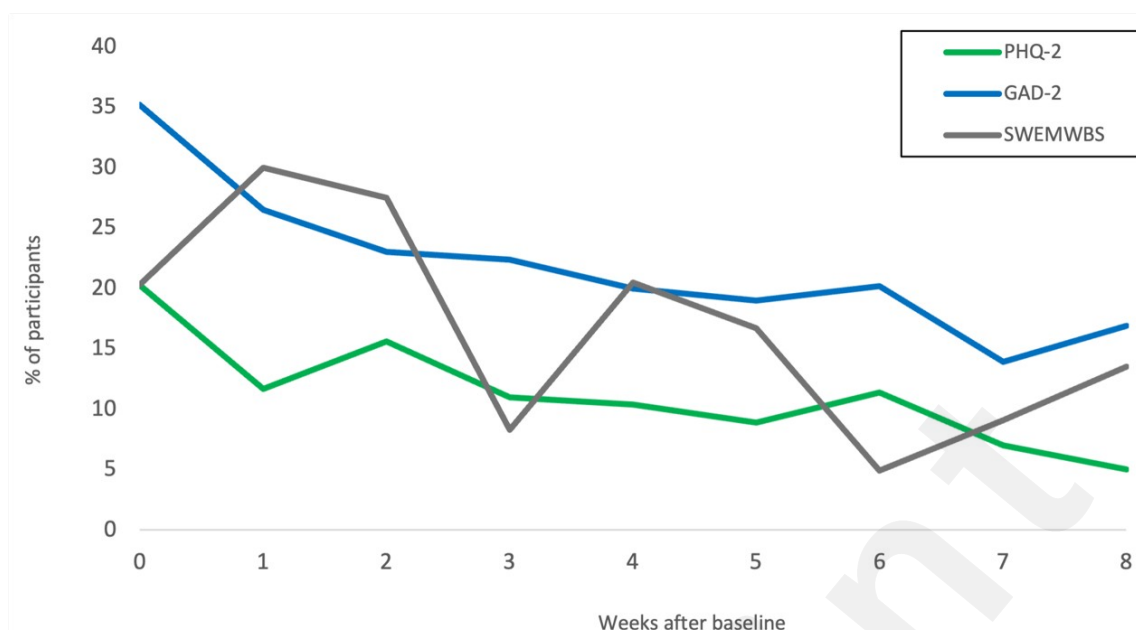


Figure 4. Proportion of students who screened positive for anxiety, depression, and well-being over 8 weeks of i-spero use. Screen positive status was dependent on the cut-off scores for each scale, as follows: PHQ-2 ≥ 3 , GAD-2 ≥ 3 , SWEMWBS ≤ 19 .

Table 7. Comparison of screening status transitions over i-spero use.^{a,b}

	n	n of baseline positive screen who improved (%)	n of baseline negative screen who worsened (%)	n of positive screen who remained positive (%)	χ^2	P
Depression – PHQ-2						
Improved vs. worsened ^b	140	19/21 (90.5)	5/119 (4.2)	-	8.17	0.0043
Improved vs. remained positive	21	19/21 (90.5)	-	2/21 (9.5)	13.76	0.0002
Anxiety – GAD-2						
Improved vs. worsened ^b	142	28/41 (68.3)	11/101 (10.9)	-	7.41	0.0065
Improved vs. remained positive	142	28/41 (68.3)	-	13/41 (31.7)	5.49	0.0191
Well-being – SWEMWBS						
Improved vs. worsened ^b	141	14/25 (56.0)	8/116 (6.9)	-	1.64	0.20
Improved vs. remained positive	25	14/25 (56.0)	-	11/25 (44.0)	0.36	0.55

^aChi-square tests performed for students with screening status reported at both baseline and 8 weeks.

^bMcNemar's test used to compare proportions of students who improved screening status vs. showed no change.



A small subset of students had paired PHQ-9 and GAD-7 score data, given the full measures only being administered after a positive screen on the briefer measures. Among students who screened positive on the PHQ-2 at both baseline and 8-Weeks ($n=12$) there was a significant decrease in mean PHQ-9 total scores over Platform use (15.70 ± 5.14 vs. 19.10 ± 3.45 , $P=.013$; Cohen's $d=0.97$), indicating some score improvement. No such differences were observed between paired GAD-7 scores. There were no differences in the proportion of students who improved in their PHQ-9 and GAD-7 screening status vs worsened in their screening status from baseline to 8-Weeks. The proportion of students who completed the full measures at both time points had greater odds of showing no change in screening status than improvement in screening status for the PHQ-9 (10% vs. 90%, $c^2 P=.0002$, $n=26$) and GAD-7 (7.7% vs. 92.3%, $c^2 p<.0001$ $n=26$).

Discussion

Principal findings

The current study aimed to assess the acceptability and effectiveness of an adapted web-based platform tailored to support university student well-being and mental health in a large sample of undergraduate students. Our findings suggest that the student-facing U-Flourish Platform (adapted from i-spero®) was highly acceptable to students and was perceived to have positive impact on their mental health. Furthermore, students using the platform reported a decrease in anxiety and depressive symptoms over 8-Weeks and improvement in well-being levels. There was some evidence that students with clinically significant levels of anxiety and depressive symptoms at baseline benefited most from using the platform. Overall, there was no evidence of harm or differential effects across student user subgroups (i.e., based gender, lifetime history of a mental disorder, or international student status). Overall, these findings support the acceptability and effectiveness of a sustainable and scalable digital platform of self-guided well-being and mental health support developed in partnership with students.

Adherence and attrition

Generally, adherence and attrition remain challenges to fidelity and efficacy of digital resources and interventions for young people [11]. In the current study, both adherence and attrition lowered somewhat over Weeks 1 and 2, remained modest and steady through Weeks 2-6, and declined substantively in Weeks 7 and 8, timed with the discontinuation of incentivized use and the end of the academic term. Students reported improvement and lack of time as reasons for discontinuation, which also coincided with timing of summative assignments and final examinations. Compared to pilot study findings [17], modest (10-15%) improvements to adherence and attrition rates were observed in the current study, possibly related to the adoption of briefer and fewer core measures, more interactive and actionable well-being plans informed by pilot student feedback. Indeed, digital mental health interventions for young people with a coaching component have demonstrated higher retention than self-guided comparators [12]. The proportion of students who completed 8 weeks of data collection using the U-Flourish Platform (34.6%) was slightly less than completion rates reported for digital interventions for clinical depression in a meta-analysis in adults of 44.2% [28]. The attrition rates for this study after Week 6 (between Weeks 7-8) were greater than what has been reported in short-duration smartphone-delivered mental health interventions (24.1%) [29] or among at-risk youth in who were undertaking a self-guided intervention with more infrequent symptom measurement (29%) [12]; however, the 6-Week attrition rate was comparable to these studies. Nonetheless, it remains difficult to compare attrition and adherence given the heterogeneity in participant samples, study design, and duration, and that the current study evaluated a self-guided well-being platform that featured symptom monitoring and planning, rather than a standardized

therapeutic intervention per se [30, 31].

Acceptability and utility

Acceptability and perceived utility of digital mental health tools are critical to user engagement and outcomes [32]. In our study, a majority of students reported high levels of overall satisfaction and willingness to recommend the platform to their peers. Ease of use, usefulness for monitoring well-being, understanding one's own feelings, and knowing when to seek help were also positively rated outcomes of Platform use and were endorsed by most students. Nonetheless, there was considerable neutrality around some aspects, particularly around seeking help, streamlined support access, and trying to find the right resource for a specific need (i.e., personalized). Further, an interactive component was reported as desired feature, which warrants consideration for future development (e.g., artificial intelligence chatbots) [33]. These aspects of resources have been described as highly desirable among students and youth [17, 34].

Only a single student in this study shared that the U-Flourish Platform had a negative impact on their mental health. Most participants reported positive experiences in open-text responses. Despite concerns about the negative impact of inadvertent over-pathologizing or exacerbation of common anxiety and depressive symptoms [35], there was no evidence from this study that students using the platform experienced these negative outcomes. Overall, while acceptability is not consistently measured [13], students in this study reported high levels of acceptability and satisfaction that were comparable or exceeded those of a variety of other digital mental health supports [36]. Involvement of students in the user-centered design process and being responsive to student user feedback from the pilot study [17] may have contributed to the high level of satisfaction and utility reported in this study and improved upon student adherence and attrition.

Effectiveness

The improvement in student-reported mental health symptoms levels and well-being among platform-users was an encouraging finding and such changes were associated with moderate effect sizes. Evidence of improvement in symptom levels for students screening positive for anxiety, depression, and low well-being at baseline was found; however, due to a lack of a control group in this study, there is uncertainty around the degree to which regression to the mean may have contributed to these results. While those that screened negative at baseline similarly showed improvement or did not change (rather than worsen), an encouraging finding, the results stratifying by baseline symptom status must still be cautiously considered. Overall, the findings support the integration of such digital platforms into a comprehensive campus mental health approach to promote well-being and support management of common mental health concerns in students.

Findings support that students felt more aware and empowered through tracking and understanding their well-being and symptom levels and being provided evidence-based, brief resource signposting to improve symptoms of common student mental health concerns. Overall, findings support that digitally enabled symptom tracking and well-being planning is not only an acceptable mental health resource, but can assist university students with symptom management and pro-health behavioural change. However, students were clear in their expressed views that features that facilitate enhanced user-interaction, match suggested supports and resources to individual need, and facilitate more streamlined access to care are highly desirable features that would improve platform utility, adoption, and impact.

Strengths and limitations

Strengths of this study include collaboration with end-users (students) in an iterative design process and development of the platform, prospective data collection, a large sample size that is broadly

representative of the reference sample of undergraduate students at Queen's, the use of brief validated screening measures, and the collection of free text from students to contextualize their user-experience. Further, the study pragmatically offered participation to consenting students, regardless of symptom status. Limitations of the current study include low rates of minoritized student subgroups and bias towards females. However, demographic factors and baseline mental health screening status did not appear to be significantly associated with ongoing platform use. A potential limitation was limiting the GAD-7 and PHQ-9 data collection to students who screened positive on the GAD-2 and PHQ-2. While this decision was made to reduce participant burden, a major barrier for engaging in self-monitoring interventions [37, 38], it came at the sacrifice of more comprehensive symptom characterization. This study did not include a comparison sample, creating some uncertainty to what degree the results of the analyses stratified by baseline screening status were influenced by regression to the mean or results were influenced by other external factors. Participating students were also recruited largely from enrolment in an online mental health literacy course and may not generalize to the overall student body; that is they might represent a subset of students particularly in improving their well-being and mental health [19].

Future directions

Future directions for this work should include evaluating the U-Flourish Platform in more diverse populations of university students and a rigorous implementation study to understand the complexities that influence adoption, scale, and spread of the platform in university settings. Further, aligned with the student feedback, leveraging technologies such as artificial intelligence (AI) tools for the purposes of increasing platform interactivity and organizing signposted services in a rationalized framework (i.e. stepped care) that map to individual clinical need and preferences would improve utility and possibly adherence.

Conclusion

In conclusion, this study is the first to our knowledge to assess a university student-tailored well-being and mental health digital platform that supports well-being planning and goal-setting, well-being and mental health symptom tracking, and provides automated feedback based on student entries in a large sample of non-help seeking undergraduate students. High levels of acceptability and utility were endorsed by student users. Platform use was associated with a reduction in anxiety and depressive symptoms over 8-Weeks, especially in students with higher levels at baseline. These findings suggest that such digital tools to support student well-being and mental health, customized by site and tailored to the personal preferences and needs, should be considered as part of an integrated plan of university student well-being and mental health support.

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Conflicts of Interest

Author JK is Chief Executive Officer of P1vital Products Limited, the developer of i-spero® and co-developed the version assessed in this study.

Abbreviations

SWEMWBS: Short Warwick-Edinburgh Mental Well-Being Scale

GAD-2: Generalized Anxiety Disorder 2-item scale.

PHQ-2: Patient Health Questionnaire-2.

GAD-9 : Generalized Anxiety Disorder 7-item scale.

PHQ-9: Patient Health Questionnaire-9

Data availability statement

Data for this study in de-identified format are available from the corresponding author upon reasonable request.

Multimedia Appendix 1

Supplemental tables and figures.

References

1. Duffy A. University Student Mental Health: An Important Window of Opportunity for Prevention and Early Intervention. *Can J Psychiatry*. 2023;68(7):495-8. PMID:37394736
2. Andersen R, Holm A, Cote JE. The student mental health crisis: Assessing psychiatric and developmental explanatory models. *J Adolesc*. 2021;86:101-14. PMID:33429156
3. Wiens K, Bhattarai A, Dores A, Pedram P, Williams JVA, Bulloch AGM, et al. Mental Health among Canadian Postsecondary Students: A Mental Health Crisis? *Can J Psychiatry*. 2020;65(1):30-5. PMID:31939333
4. Paus T, Keshavan M, Giedd JN. Why do many psychiatric disorders emerge during adolescence? *Nat Rev Neurosci*. 2008;9(12):947-57. PMID:19002191
5. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P, et al. WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *J Abnorm Psychol*. 2018;127(7):623-638. PMID:30211576
6. Lipson SK, Zhou S, Abelson S, Heinze J, Jirsa M, Morigney J, et al. Trends in college student mental health and help-seeking by race/ethnicity: Findings from the national healthy minds study, 2013-2021. *J Affect Disord*. 2022;306:138-47. PMID:35307411
7. Arday J. Understanding Mental Health: What Are the Issues for Black and Ethnic Minority Students at University? *Social Sciences*. 2018;7(10):196. DOI:10.3390/socsci7100196
8. Prince JP. University student counseling and mental health in the United States: Trends and challenges. *Mental Health & Prevention*. 2015;3(1):5-10. DOI:10.1016/j.mhp.2015.03.001

9. Duffy A, Saunders KEA, Malhi GS, Patten S, Cipriani A, McNevin SH, et al. Mental health care for university students: a way forward? *The Lancet Psychiatry*. 2019;6(11):885-7. PMID:31324561
10. Broglia E, Millings A, Barkham M. Student mental health profiles and barriers to help seeking: When and why students seek help for a mental health concern. *Counselling and Psychotherapy Research*. 2021;21(4):816-26. DOI:10.1002/capr.12462
11. Lehtimäki S, Martic J, Wahl B, Foster KT, Schwalbe N. Evidence on Digital Mental Health Interventions for Adolescents and Young People: Systematic Overview. *JMIR Ment Health*. 2021;8(4):e25847. PMID:33913817
12. Weiner LS, Crowley RN, Sheeber LB, Koegler FH, Davis JF, Wells M, et al. Engagement, Acceptability, and Effectiveness of the Self-Care and Coach-Supported Versions of the Vira Digital Behavior Change Platform Among Young Adults at Risk for Depression and Obesity: Pilot Randomized Controlled Trial. *JMIR Ment Health*. 2024;11:e51366. PMID:39298763
13. Ferrari M, Allan S, Arnold C, Eleftheriadis D, Alvarez-Jimenez M, Gumley A, et al. Digital Interventions for Psychological Well-being in University Students: Systematic Review and Meta-analysis. *J Med Internet Res*. 2022;24(9):e39686. PMID:36169988
14. Taylor ME, Liu M, Abelson S, Eisenberg D, Lipson SK, Schueller SM. The Reach, Effectiveness, Adoption, Implementation, and Maintenance of Digital Mental Health Interventions for College Students: A Systematic Review. *Curr Psychiatry Rep*. 2024. PMID:39392547
15. P1vital. [Internet]. P1vital Products Limited; [cited 2025 10 April 2025]. Available from: <https://www.p1vital.com/about-us>.
16. Browning M, Bilderbeck AC, Dias R, Dourish CT, Kingslake J, Deckert J, et al. The clinical effectiveness of using a predictive algorithm to guide antidepressant treatment in primary care (PReDicT): an open-label, randomised controlled trial. *Neuropsychopharmacology*. 2021;46(7):1307-14. PMID:33637837
17. Pankow K, King N, Li M, Byun J, Jugoon L, Rivera D, et al. Acceptability and utility of digital well-being and mental health support for university students: A pilot study. *Early Interv Psychiatry*. 2023. PMID:37650447
18. Goodday SM, Rivera D, Foran H, King N, Milanovic M, Keown-Stoneman CD, et al. U-Flourish university students well-being and academic success longitudinal study: a study protocol. *BMJ Open*. 2019;9(8):e029854. PMID:31455708
19. King N, Linden B, Cunningham S, Rivera D, Rose J, Wagner N, et al. The feasibility and effectiveness of a novel online mental health literacy course in supporting university student mental health: a pilot study. *BMC Psychiatry*. 2022;22(1):515. PMID:35907852
20. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10):1092-7. PMID:16717171
21. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606-13. PMID:11556941
22. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care*. 2003;41(11):1284-92. PMID:14583691
23. Stewart-Brown S, Tennant A, Tennant R, Platt S, Parkinson J, Weich S. Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey. *Health Qual Life Outcomes*. 2009;7:15.

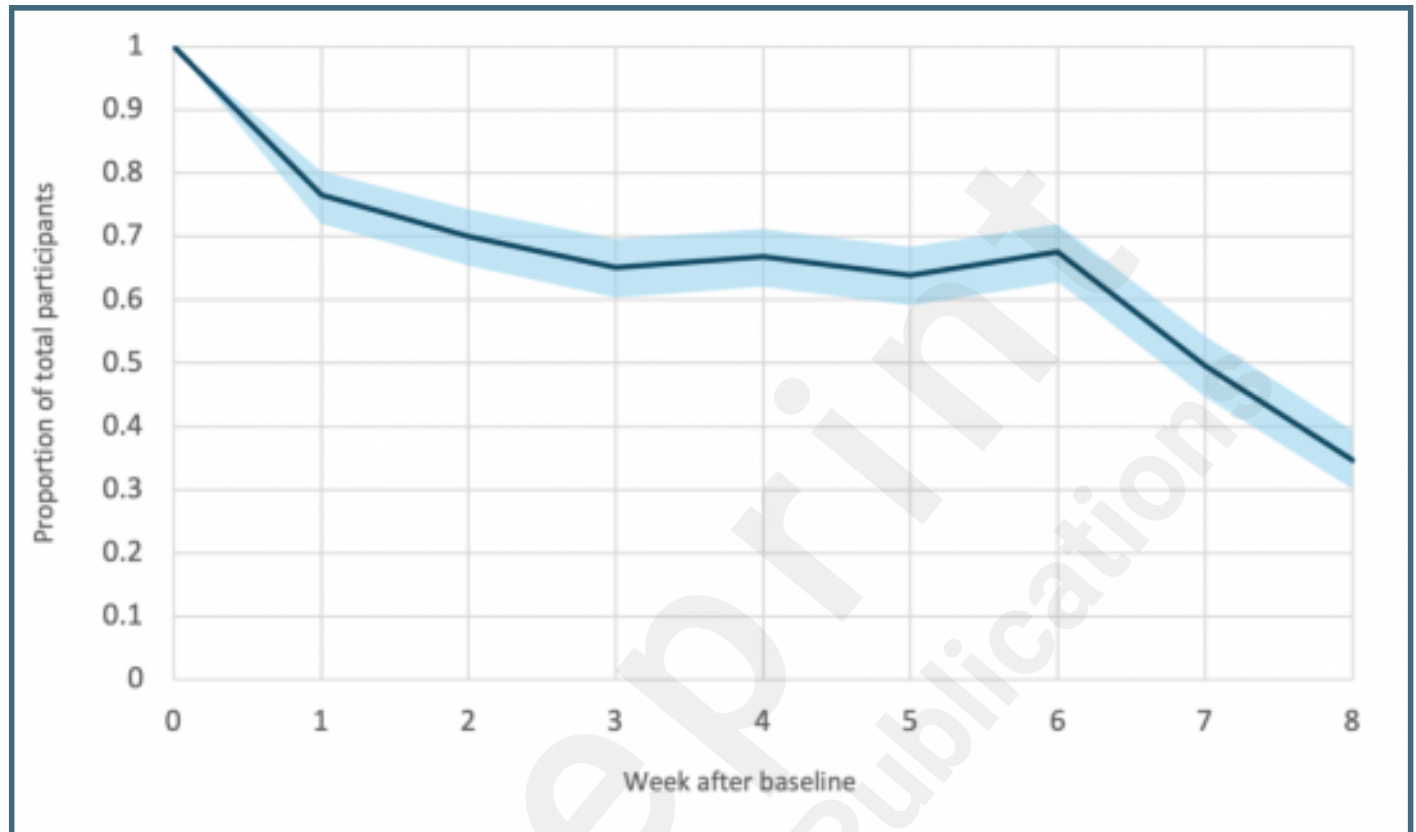
PMID:19228398

24. Ng Fat L, Scholes S, Boniface S, Mindell J, Stewart-Brown S. Evaluating and establishing national norms for mental wellbeing using the short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS): findings from the Health Survey for England. *Qual Life Res.* 2017;26(5):1129-44. PMID:27853963
25. Cohen J. *Statistical power analysis for the behavioral sciences*: routledge; 2013. DOI:10.4324/9780203771587
26. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol.* 2013;13:117. PMID:24047204
27. Ritchie J, Lewis J. *Qualitative Research Practice: A Guide for Social Science Students and Researchers*: SAGE Publications; 2003. ISBN:0761971106,
28. Forbes A, Keleher MR, Venditto M, DiBiasi F. Assessing Patient Adherence to and Engagement With Digital Interventions for Depression in Clinical Trials: Systematic Literature Review. *J Med Internet Res.* 2023;25:e43727. PMID:37566447
29. Linardon J, Fuller-Tyszkiewicz M. Attrition and adherence in smartphone-delivered interventions for mental health problems: A systematic and meta-analytic review. *J Consult Clin Psychol.* 2020;88(1):1-13. PMID:31697093
30. Boucher EM, Raiker JS. Engagement and retention in digital mental health interventions: a narrative review. *BMC Digital Health.* 2024;2(1):52. DOI:10.1186/s44247-024-00105-9
31. Renfrew ME, Morton DP, Morton JK, Hinze JS, Przybylko G, Craig BA. The Influence of Three Modes of Human Support on Attrition and Adherence to a Web- and Mobile App-Based Mental Health Promotion Intervention in a Nonclinical Cohort: Randomized Comparative Study. *J Med Internet Res.* 2020;22(9):e19945. PMID:32990633
32. Perski O, Short CE. Acceptability of digital health interventions: embracing the complexity. *Transl Behav Med.* 2021;11(7):1473-80. PMID:33963864
33. Boucher EM, Harake NR, Ward HE, Stoeckl SE, Vargas J, Minkel J, et al. Artificially intelligent chatbots in digital mental health interventions: a review. *Expert Review of Medical Devices.* 2021;18(sup1):37-49. PMID:34872429
34. Garrido S, Millington C, Cheers D, Boydell K, Schubert E, Meade T, et al. What Works and What Doesn't Work? A Systematic Review of Digital Mental Health Interventions for Depression and Anxiety in Young People. *Front Psychiatry.* 2019;10:759. PMID:34872429
35. Foulkes L. The problem with mental health awareness. *Br J Psychiatry.* 2024;225(2):337-8. PMID:39399916
36. Lau CKY, Saad A, Camara B, Rahman D, Bolea-Alamanac B. Acceptability of Digital Mental Health Interventions for Depression and Anxiety: Systematic Review. *J Med Internet Res.* 2024;26:e52609. PMID:39466300
37. de Thurah L, Kiekens G, Weermeijer J, Uyttebroek L, Wampers M, Bonnier R, et al. Understanding Appropriation of Digital Self-Monitoring Tools in Mental Health Care: Qualitative Analysis. *JMIR Hum Factors.* 2025;12:e60096. PMID:40029626
38. Zhu S, Wang Y, Hu Y. Facilitators and Barriers to Digital Mental Health Interventions for Depression, Anxiety, and Stress in Adolescents and Young Adults: Scoping Review. *J Med Internet Res.* 2025;27:e62870. PMID:40127430

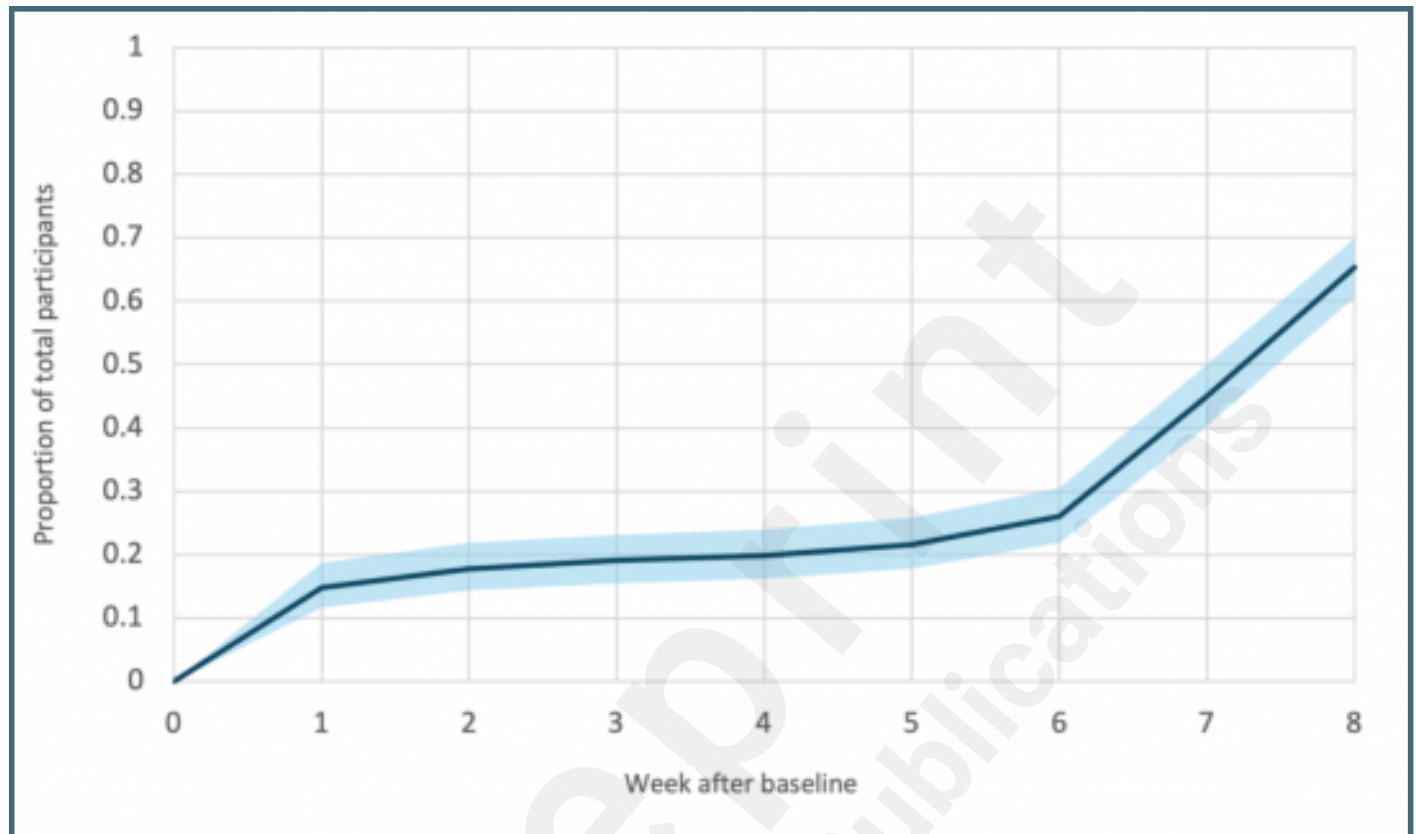
Supplementary Files

Figures

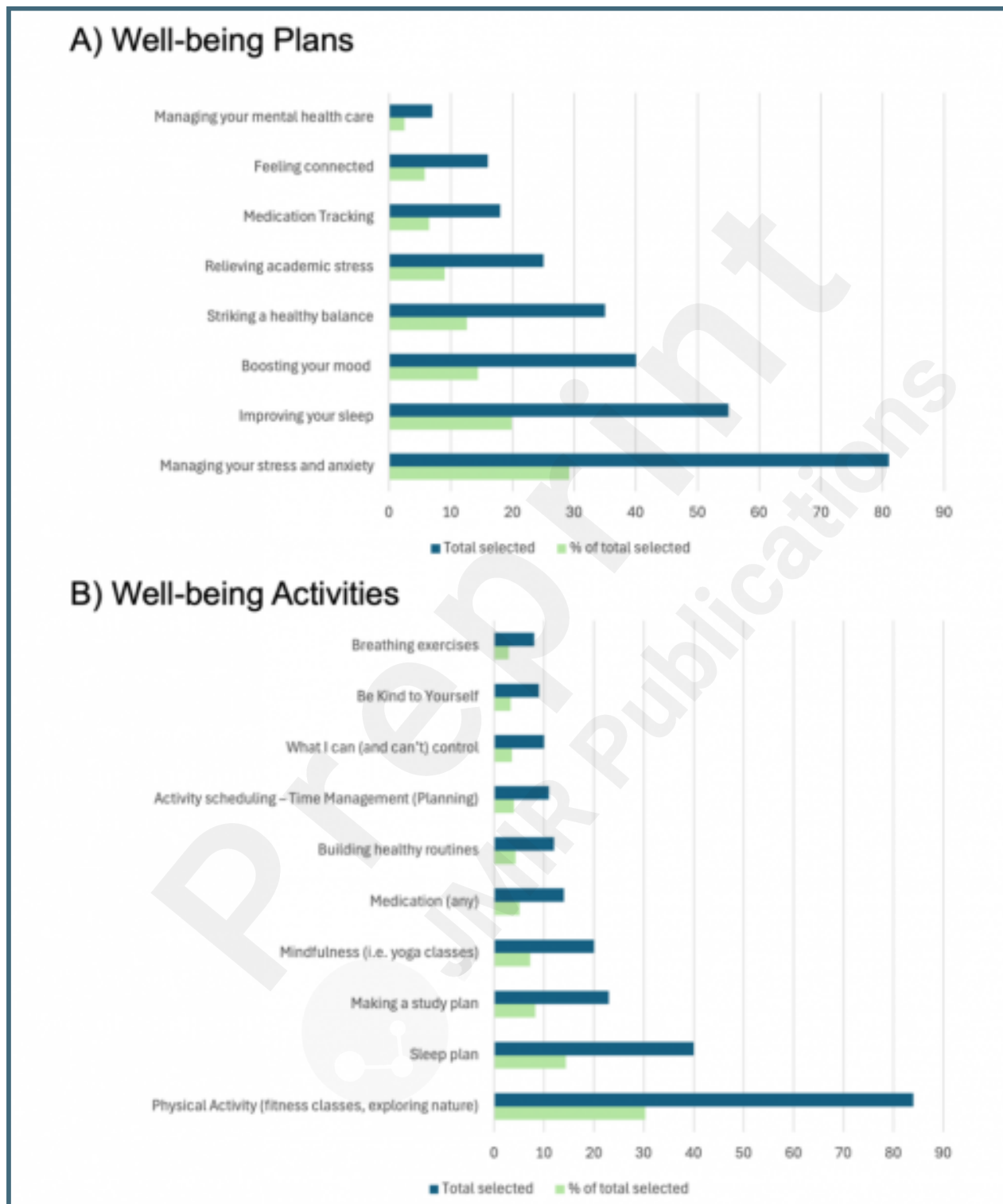
Adherence to mandatory symptom screening measures over 8 weeks (n=404). Adherence was defined as having completed the weekly PHQ-2 or GAD-2 screening questionnaires and was expressed as the proportion of the total number of students who registered for i-spero and completed a baseline questionnaire (n=404). 95% confidence intervals were calculated using Wilson's score approach and are represented by the shaded area.



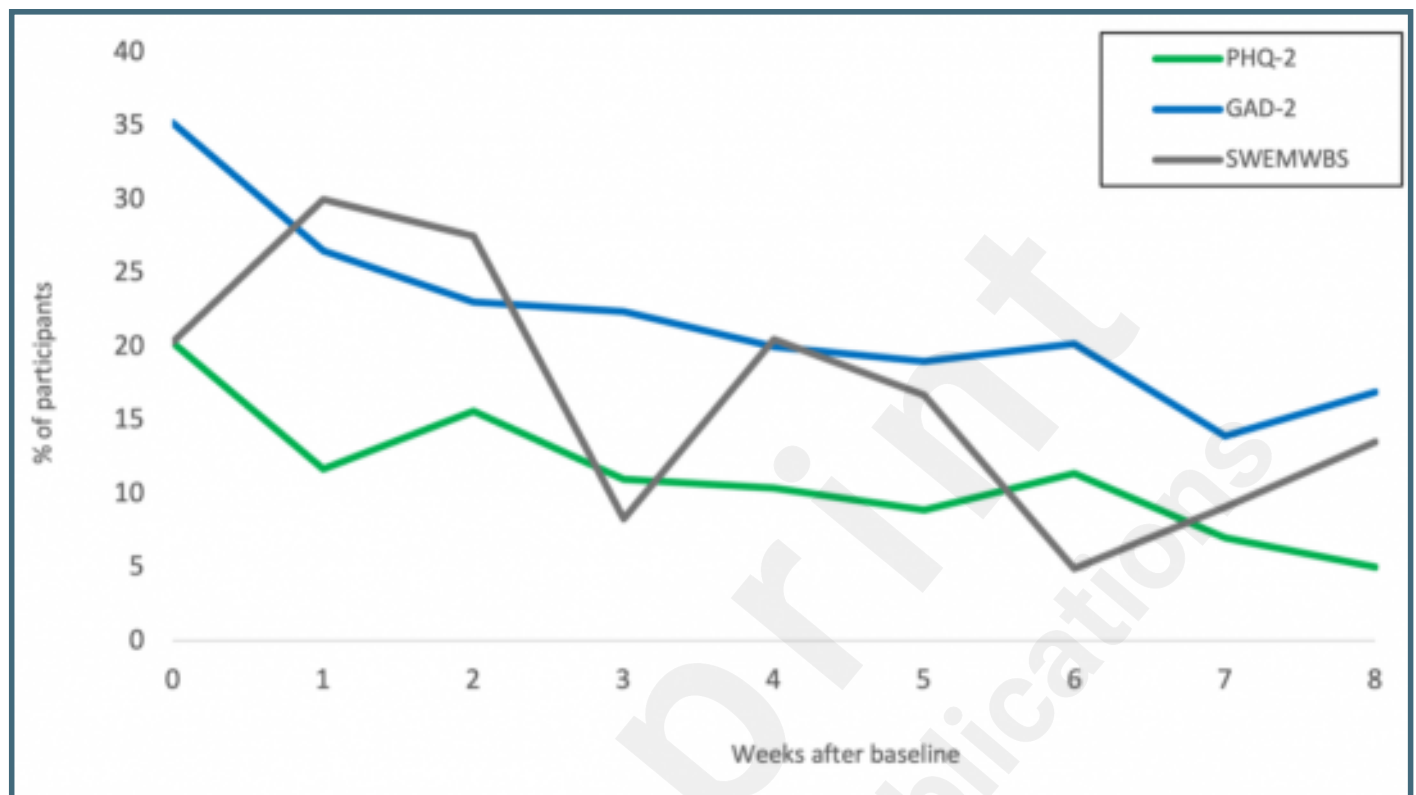
Attrition from platform use over 8 weeks. Weekly cumulative attrition was described as the proportion of students who registered for i-spero and completed the baseline questionnaire (n=404) that ceased completing the PHQ-2 or GAD-2 screening measures for the remaining 8 weeks. 95% confidence intervals were calculated using Wilson's score approach and are represented by the shaded area.



Student selection of well-being plans (Panel A) and associated activities (Panel B). Only activities selected ≥ 5 times are presented. $n=277$.



Proportion of students who screened positive for anxiety, depression, and well-being over 8 weeks of i-spero use. Screen positive status was dependent on the cut-off scores for each scale, as follows: PHQ-2 ≥ 3 , GAD-2 ≥ 3 , SWEMWBS ≤ 19 .



Multimedia Appendixes

Supplemental tables.

URL: <http://asset.jmir.pub/assets/c9fb0a32e86372418ece97a113552945.docx>

