

Who Uses Online Support Services? Mental Health, Help- Seeking and Reasons for Non-Use Among University Students

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Abstract

Background:

While university students are particularly vulnerable to psychological distress, many do not receive adequate professional support. Digital mental health services may help address this gap, but factors associated with their use have received limited attention.

Methods:

University students participating in the *enhance* program completed baseline and six-week follow-up assessments. Participants attending at least one online counseling session were classified as users, those attending none as non-users. Changes in mental health outcomes were examined using linear mixed-effects models. Help-seeking behavior, referral outcomes, and reasons for non-use were examined using descriptive and qualitative methods.

Results:

Of $n = 455$ baseline participants, $n = 85$ (18.7%) completed the six-week follow-up. Significant symptom reductions over time were observed for depression (PHQ-9: $F = 20.518$, $p < 0.001$), anxiety (GAD-7: $F = 30.635$, $p < 0.001$), and disordered eating (EDE-Q8: $F = 5.203$, $p = 0.025$), but not alcohol use (AUDIT-C: $F = 1.133$, $p = 0.292$). Neither user status nor the interaction between time and user status reached statistical significance.

Among the $n = 37$ participants receiving a referral recommendation and completing follow-up, $n = 12$ (32.4%) contacted the recommended service, most commonly reporting encouragement ($n = 11$, 91.7%), a clearer understanding of their problems ($n = 9$, 75.0%), and feeling supported ($n = 9$, 75.0%). Among participants who did not contact the recommended service and reported barriers ($n = 16$), lack of time ($n = 11$, 68.8%) and reluctance to discuss concerns with strangers ($n = 10$, 62.5%) were most common.

Most frequently reported reasons for non-use ($n = 82$) were lack of time ($n = 23$, 26.7%) and motivation ($n = 21$, 24.4%) as well as only using the app ($n = 14$, 16.3%). Free-text responses additionally identified poor physical or mental health, technical difficulties, and 'not feeling ready' as relevant.

Conclusion:

The findings suggest that *enhance* provides an accessible service for psychologically distressed university students. Although symptom improvements could not be linked specifically to counseling participation, counseling may facilitate further help-seeking and access to additional care. Addressing barriers to engagement and referral uptake may help improve digital mental health services.

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Introduction

Mental disorders represent a major public health challenge worldwide, with mental health conditions such as depression or anxiety accounting for a substantial proportion of the global disease burden. While age-standardized rates have remained relatively stable, the absolute burden of mental disorders continues to rise due to population growth, increasing pressure on healthcare systems [1]. However, this pattern differs for younger populations, as recent Global Burden of Disease analyses indicate rising rates of depressive and anxiety disorders among adolescents and young adults [2]. As many mental disorders first emerge during adolescence and young adulthood, this life stage represents a key window for prevention and early intervention [3].

While university students represent a particularly vulnerable population, many do not receive adequate treatment [4]. Poor mental health among university students is influenced by a complex interplay of academic, psychological, social, financial, biological, and lifestyle-related factors, all of which have been associated with an increased risk of stress, anxiety, and depression. Another particularly concerning development is the increase in suicidal ideation among university students observed during the COVID-19 pandemic. While depressive symptoms decreased in 2022 compared with 2020 and 2021, the prevalence of suicidal ideation continued to rise [5]. The growing demand for mental health support among university students has challenged the capacity of university counseling services, making alternative and scalable forms of support, such as online counseling, increasingly important [6]. Consistent with this, a systematic review of digital mental health interventions for college students found beneficial effects on depression, anxiety, and psychological well-being and demonstrated their potential to improve access to mental health support [7].

However, the effectiveness of E-mental health interventions depends not only on their availability but also on whether users engage with and continue to use these services. Engagement is considered an essential component of digital mental health interventions, yet user engagement remains consistently low, which may limit intervention effects [8]. Despite promising evidence of effectiveness, evidence on implementation outcomes of digital mental health interventions for university students remains limited. In particular, intervention uptake has generally been modest, while implementation and maintenance outcomes have been reported less consistently [9].

Accordingly, online support services that combine digital interventions with professional counseling may represent a promising approach to addressing the mental health needs of university students. While previous research has mainly focused on the efficacy and effectiveness of digital mental health interventions, less attention has been paid to differences between students who participate in offered counseling services and those who do not. In particular, limited evidence is available on differences in mental health outcomes and help-seeking behavior based on counseling participation, as well as on reasons for non-participation.

This study aimed to compare students, who used an online support service with those who did not in terms of changes in mental health outcomes from baseline to follow-up, help-seeking behavior, and reasons for non-use.

Materials and Methods

Study Design

A pragmatic, self-selected cohort design was used, with students voluntarily enrolling in an online mental health program ("*enhance*"). Standardized self-report questionnaires were administered at baseline (T0), post-intervention (T1), and follow-up (T2). The present analyses were based on questionnaire data collected at baseline (T0) and follow-up (T2), supplemented by intervention metadata obtained during the intervention period (T1). Data was collected between November 2022 and June 2026.

Participants and Procedure

Students from six universities in the state of Saxony, Germany were informed about the study and the *enhance* program through campus advertisements, brochures, and student service websites, which provided information about the program and a link to the registration platform (<https://enhance-university.de/>).

To be eligible, participants had to be at least 18 years of age, enrolled at one of the participating universities, able to provide informed consent, proficient in German, and possess sufficient visual and reading abilities. Furthermore, access to the internet, a valid email address, and a smartphone or computer were required for participation.

Before enrollment, all participants received comprehensive information about the study procedures and data protection regulations, including downloadable study documents. Electronic informed consent was obtained using an opt-in procedure. Participants then created an account on the *enhance* platform by registering with an email address and a self-selected password. Registration was completed upon submission of the baseline questionnaire (T0), after which access to the intervention was granted. A unique participant identifier was automatically generated to link questionnaire responses with the corresponding user account. Ethical approval for the study was granted by the Ethics Committee of Leipzig University on 11 November 2021 (reference no. 509/21-ek).

Outcome assessments were conducted at predefined time points: immediately post-intervention (T1) and six weeks later (T2), with reminder emails sent to non-responders.

Participants were classified as dropouts if they had completed informed consent, registration, and the baseline assessment but did not engage with any intervention within two weeks after registration during the six-week study period, or if they withdrew their consent at any time.

Description of the App and the offered Counseling Services

Enhance was originally designed as an on-demand preventive intervention for university students, addressing both primary and secondary prevention. The program was developed to supplement, rather

than replace, existing counseling and psychotherapeutic services by offering a low-threshold gateway to mental healthcare and supporting referral to appropriate services where indicated.

App intervention

The *enhance* app, developed using the m-path platform, constitutes a core component of the *enhance* program. Originally developed by a research team at Katholieke Universiteit Leuven, m-path provides a flexible and customizable infrastructure for delivering smartphone-based ecological momentary assessment (EMA) and ecological momentary interventions (EMIs) in both research and clinical settings within a blended-care approach [10]. The app was designed to support the stabilization and ongoing tracking of participants' mental health and behavior while providing users with the opportunity to engage in self-monitoring

Counseling sessions

Individual counseling sessions via chat, video, and email were offered to provide psychoeducational support and guidance, with counselors referring the participants to appropriate support services when needed.

Chat sessions were conducted through the messaging app Signal, while video sessions were delivered via the platform RED connect basis, which is certified by the National Association of Statutory Health Insurance Physicians in Germany. Signal and RED are both adhering to the General Data Protection Regulation (GDPR). Email counseling was provided through a dedicated project email account hosted by the Medical Faculty of Leipzig University.

Participants could register for any of the available support services through the *enhance* website. All counseling sessions were delivered by psychologists or psychotherapists in training.

To maintain the low-threshold and acute nature of the counseling services, participation was subject to predefined limits. Chat and video sessions were scheduled in advance and typically lasted up to 20 minutes. In contrast, counseling via email continued until the participant's concern had been addressed or referral to an appropriate service had been recommended. These limits could be exceeded at the counsellor's discretion when clinically indicated.

Across the study period, participants were eligible to attend a maximum of three sessions within each counseling modality. A schematic representation is provided in Fig. 1.

Definition of Users and Non-Users

Participants were assigned to either the user or non-user group based on their utilization of the available counseling services. Completion of the baseline assessment followed by engagement with at least one session in one of the counseling modalities (chat, video, or email) defined the user group, whereas

participants who completed the baseline assessment without subsequently accessing any counseling service were categorized as non-users.

Measures

Sociodemographic Data

At baseline (T0), participants completed a questionnaire capturing sociodemographic characteristics, including age, gender, relationship status, employment status, living situation, the presence of children in the household, and psychological distress.

Mental Health Measures

Depressive Symptoms

Depressive symptoms were measured at baseline (T0) and in the follow-up (T2) using the Patient Health Questionnaire-9 (PHQ-9). Participants indicated how often they had experienced each symptom during the previous two weeks on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"). Responses were summed to yield a total score between 0 and 27, with higher scores indicating greater severity of depressive symptoms [11].

Anxiety Symptoms

Symptoms of anxiety were evaluated at baseline (T0) and in the follow-up using the Generalized Anxiety Disorder-7 Questionnaire (GAD-7). The instrument comprises seven items assessing the frequency of anxiety symptoms experienced during the preceding two weeks. Responses are rated on a 4-point Likert scale ranging from 0 ("not at all") to 3 ("nearly every day"). Item scores are summed to generate a total score between 0 and 21, with higher scores indicating greater symptom severity [12].

Eating Disorder Symptoms

Participants' eating-related psychopathology was assessed at T0 and T2 using the Eating Disorder Examination Questionnaire-8 (EDE-Q8). The questionnaire includes eight items assessing eating disorder symptoms experienced over the previous 28 days. Responses are recorded on a 7-point Likert scale ranging from 0 ("characteristic is not present") to 6 ("characteristic is present every day or in an extreme form") [13].

Alcohol Consumption

Alcohol consumption was assessed at T0 and T2 using the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C), which includes the first three items of the full Alcohol Use Disorders Identification Test (AUDIT) and evaluates the frequency of alcohol consumption, the typical amount of alcohol consumed on drinking days, and the frequency of heavy episodic drinking (defined as consuming more than six drinks on one occasion). Each item is scored on a scale from 0 to 4; with higher scores

reflecting a greater likelihood of hazardous alcohol consumption [14]. An additional item assessed participants' use of other drugs. Responses were scored on a scale from 0 ("never") to 4 ("at least four times a week"), resulting in a total score ranging from 0 to 16.

Discrimination

Beginning in November 2024, the baseline assessment (T0) included items assessing participants' experiences of discrimination. The questionnaire covered discrimination related to nationality or ethnic background, disability, gender, gender identity, sexual orientation, religion, age, income, and educational attainment.

Follow-up Questionnaire

In addition to the mental health outcome measures (PHQ-9, GAD-7, EDE-Q8 and AUDIT-C), the follow-up questionnaire included items assessing referral outcomes, referral recommendations, facilitators of help-seeking, and barriers to help-seeking. Referral outcomes included whether participants had received a recommendation to contact a specific service or provider during their participation in the support service and whether they had subsequently contacted the recommended service or provider. Participants who reported having contacted the recommended service or provider were directed to the questions on referral recommendations and facilitators of help-seeking. Those who indicated that they had not established contact were directed to the questions assessing barriers to help-seeking.

Non-Use Questionnaire

The non-use questionnaire assessed reasons for not using the support service. Participants could select a reason for non-use from a dropdown menu containing predefined response options and were able to provide further reasons in a free-text field. If they sought help elsewhere, they were also given the opportunity to specify the service or provider in a separate free-text response.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 31. All hypothesis tests were two-sided, with statistical significance set at an alpha level of 0.05.

Participants who attended at least one counseling session and were therefore represented in the counseling session metadata were classified as users, whereas participants who did not attend any counseling sessions were classified as non-users.

Due to missing baseline data, six participants had to be excluded from the analyses.

First, the metadata on counseling sessions were aggregated at participant level using the participant ID, and a dichotomous "user" variable was created. Subsequently, the baseline, follow-up, non-use questionnaire, and counseling session metadata datasets were merged.

Descriptive statistics were calculated for participants' sociodemographic characteristics (See Table 1), baseline questionnaire data (T0) and follow-up responses (T2). The Baseline questionnaire included

questions regarding the student's experiences of discrimination, their intentions of help-seeking, their utilization of counseling services in the past and their knowledge and past utilization of counseling services at their university (See Tables 2–4).

Baseline and follow-up outcome measures included the scores of the PHQ-9, GAD-7, EDE-Q8, and AUDIT-C questionnaires. For each questionnaire, a new variable representing the total score was created by summing the individual item scores.

The session metadata were analyzed descriptively to identify the frequency of referral recommendations. Although up to three referral recommendations could be documented per counseling session, the analysis was restricted to the recommendation associated with the main reason for consulting the counseling service.

The descriptive analyses also contained follow-up data on referrals made during counseling sessions, factors facilitating help-seeking behavior and barriers experienced by participants while taking part in the study. Due to an error in the questionnaire administration logic identified on March 8 2024, participants who had received a single referral recommendation but did not contact the recommended service or provider were not presented with the questionnaire assessing barriers to help-seeking. Conversely, participants who had not received any referral recommendation were erroneously presented with this questionnaire until the error was corrected. These participants were excluded from the corresponding analyses.

Potential differences between participants who completed the follow-up questionnaire and those who did not were compared using independent-samples t-tests for continuous variables and chi-square tests for categorical variables. Cramer's V was used to quantify effect sizes. To improve interpretability and ensure adequate cell frequencies, selected categorical variables were recategorized into fewer groups. Participants completing the follow-up questionnaire were defined as responders, while those who did not were classified as non-responders.

Changes in mental health outcomes (PHQ-9, GAD-7, EDE-Q8 and AUDIT-C) were examined using separate linear mixed-effects models (LMMs). For each outcome, time (baseline vs. follow-up), service utilization (user vs. non-user), and the interaction between time and service utilization were entered as fixed effects. Participant ID was included as a random intercept to account for repeated observations within individuals. The primary effect of interest was the interaction between time and service utilization, indicating whether changes over time differed between users and non-user of the counseling service.

As a sensitivity analysis, t-tests for paired samples were conducted among participants with complete baseline and follow-up data to examine pre-post changes in each outcome measure. The results were compared with those obtained from the LMMs to assess the robustness of the findings.

Responses to the questionnaire on reasons for non-use were analyzed descriptively. In addition, participants were able to provide free-text responses, which were examined using MAXQDA 2022 version

22.6.1. Free-text responses were coded both as new themes and within the existing dropdown categories when they matched the corresponding predefined reasons. Subsequently, responses matching the predefined response options were integrated into the respective response categories for the descriptive analyses.

Free-text responses on where participants sought help were analyzed descriptively as well.

Results

Sociodemographic characteristics

A total of $n = 455$ students completed the baseline questionnaire. The majority, $n = 349$ (76.7% identified as female, $n = 85$ (18.7%) as male, and $n = 21$ (4.6%) as diverse. Participants were between 18 and 53 years of age, with a mean age of 24.18 years ($SD = 4.68$).

The majority of participants reported being single ($n = 244$, 53.6%) and living in shared accommodation ($n = 328$, 72.1%). Most also indicated having no history of migration ($n = 374$, 82.2%). Regarding parental educational attainment, the majority reported that neither their mother ($n = 248$, 54.5%) nor their father ($n = 223$, 48.9%) held an academic degree.

Approximately half of the sample ($n = 228$, 50.1%) was enrolled in a master's degree program or an equivalent qualification (e.g., state examination or diploma). Participants had been enrolled in their current degree program for a mean of 7.98 semesters ($SD = 4.79$), ranging from one to 31 semesters. In addition, most participants ($n = 305$, 67.0%) reported a current monthly net income of less than 1000 €.

Table 1
Sociodemographic characteristics of the sample (*n* = 455)

Variable	<i>n</i> (%)
Gender	
Female	349 (76.7)
Male	85 (18.7)
Diverse	21 (4.6)
Relationship status	
Married	15 (3.3)
In a committed relationship	192 (42.2)
In a registered civil partnership	2 (0.4)
Single	244 (53.6)
Divorced	2 (0.4)
Living situation	
Alone	127 (27.9)
With partner/spouse, children, other relatives or with others in a shared living arrangement	328 (72.1)
Targeted academic degree	
Bachelor	187 (41.1)
Master (or equivalent degree, i.e. state exam or diploma)	228 (50.1)
Other	40 (8.8)
Current monthly net income	
No personal income	78 (17.1)
0–499 €	82 (18.0)
500–999 €	145 (31.9)
1000–1499 €	111 (24.4)

Variable	<i>n</i> (%)
Gender	
1500–1999 €	13 (2.9)
2000–2999 €	10 (2.2)
≥ 3000 €	5 (1.1)
No information provided	11 (2.4)
Migration history	
Immigrant	43 (9.5)
At least one parent is an immigrant	41 (9.0)
No history of immigration	374 (82.2)
Highest professional qualification of mother/ first parent	
No professional qualification	16 (3.5)
Apprenticeship/ vocational training diploma	196 (43.1)
Master craftsman certificate, state certified technician	36 (7.9)
University degree	183 (40.2)
Unknown	8 (1.8)
No information provided	16 (3.5)
Highest professional qualification of father/ second parent	
No professional qualification	17 (3.7)
Apprenticeship/ vocational training diploma	138 (30.3)
Master craftsman certificate, state certified technician	68 (14.9)
University degree	202 (44.4)
Unknown	16 (3.5)
No information provided	14 (3.1)

Discrimination

A total of $n = 71$ (15.6%) participants completed the baseline questionnaire containing the additional items on experiences of discrimination added in November 2024. Most participants reported having

neither an impairment ($n = 53$, 74.6%) nor a disability ($n = 67$, 94.4%). Furthermore, experiences of discrimination were uncommon across all assessed domains. The majority of participants indicated that they had not experienced discrimination related to disability or chronic illness ($n = 59$, 83.1%), racism or nationality ($n = 63$, 88.7%), gender ($n = 40$, 56.3%), gender identity ($n = 66$, 93.0%), religion or beliefs ($n = 67$, 94.4%), older or younger age ($n = 65$, 91.5%; $n = 65$, 91.5%), sexual orientation ($n = 59$, 83.1%), lower educational attainment ($n = 66$, 93.0%), low income ($n = 60$, 84.5%) or other reasons ($n = 57$, 80.3%).

Help-seeking intentions, utilization of counseling services in the past and the knowledge and past utilization of counseling services at the participant's university

Most participants indicated that they would be likely or very likely to use psychiatric ($n = 289$, 63.5%) or psychotherapeutic ($n = 398$, 87.5%) treatment as well as psychological or psychosocial counseling ($n = 382$, 83.9%) and online mental health services ($n = 349$, 76.2%) if support was needed. In contrast, considerably fewer students reported a willingness to consult alternative practitioners specializing in psychotherapy ($n = 132$, 29.0%), receive inpatient psychiatric or psychosomatic treatment ($n = 99$, 21.7%), or use self-help books ($n = 224$, 49.2%) (see Table 2). Overall, previous utilization of mental health support services was low at the time of the study (see Table 3). Participants most reported being aware of the Central Student Advisory Service ($n = 386$, 84.8%) and psychological or psychosocial counselling services ($n = 341$, 74.9%), while fewer were familiar with support centers for students with children ($n = 307$, 67.5%). Awareness of digital services offered by the university was low, with only a minority of students reporting that they were familiar with these services ($n = 168$, 36.9%). Previous utilization of support services was also limited, with most students indicating that they had never accessed any of these services, especially digital support options ($n = 410$, 90.1%) (see Table 4).

Table 2
Help-seeking intentions (*n* = 455)

What kind of support would you seek if you were experiencing mental health issues?	Very unlikely (<i>n</i>, %)	Unlikely (<i>n</i>, %)	Likely (<i>n</i>, %)	Very likely (<i>n</i>, %)
Psychiatrist	64 (14.1)	102 (22.4)	139 (30.5)	150 (33.0)
Psychotherapy	15 (3.3)	42 (9.2)	115 (25.3)	283 (62.2)
Alternative practitioner specializing in psychotherapy	189 (41.5)	134 (29.5)	83 (18.2)	49 (10.8)
Psychological/psychosocial counseling	23 (5.1)	50 (11.0)	154 (33.8)	228 (50.1)
Stay in a psychiatric/psychosomatic clinic	240 (52.7)	116 (25.5)	62 (13.6)	37 (8.1)
Online support services for mental health issues	25 (5.5)	81 (17.8)	151 (33.2)	198 (43.5)
Self-help books	102 (22.4)	129 (28.4)	101 (22.2)	123 (27.0)

Table 3
Utilization of mental health services in the past (*n* = 455)

Which of the following support services for mental health have you used at some point or in the last year?	Already used this service at some point (<i>n</i>, %)	Used the service in the past year (<i>n</i>, %)	Didn't use the service (<i>n</i>, %)
Psychiatrist	45 (9.9)	47 (10.3)	363 (79.8)
Psychotherapy	99 (21.8)	85 (18.7)	271 (59.6)
Alternative practitioner specializing in psychotherapy	10 (2.2)	12 (2.6)	433 (95.2)
Psychological/psychosocial counseling	105 (23.1)	80 (17.6)	270 (59.3)
Stay in a psychiatric/psychosomatic clinic	49 (10.8)	13 (2.9)	393 (86.4)
Online support services for mental health issues	69 (15.2)	79 (17.4)	307 (67.5)
Self-help books	86 (18.9)	120 (26.4)	249 (54.7)

Table 4

Knowledge and past utilization of psychosocial counseling and online services at universities ($n = 455$)

To the best of your knowledge, what advisory and support services does your university offer?	Yes (<i>n</i>, %)	No (<i>n</i>, %)	I don't know (<i>n</i>, %)
Central Student Advisory Service	386 (84.8)	3 (0.7)	66 (14.5)
Psychological, psychosocial or psychotherapeutic counseling for students	341 (74.9)	9 (2.0)	105 (23.1)
Support centers for students with children	307 (67.5)	7 (1.5)	141 (31.0)
Digital services	168 (36.9)	22 (4.8)	265 (58.2)
Which advisory and support services offered by your university have you already made use of?	Used this service once (<i>n</i>, %)	Used this service multiple times (<i>n</i>, %)	Never used this service (<i>n</i>, %)
Central Student Advisory Service	85 (18.7)	19 (4.2)	351 (77.1)
Psychological, psychosocial or psychotherapeutic counseling for students	79 (17.4)	57 (12.5)	319 (70.1)
Support centers for students with children	8 (1.8)	6 (1.3)	441 (96.9)
Digital services	31 (6.8)	14 (3.1)	410 (90.1)

Referral recommendations in the Meta Data

Of the $n = 150$ primary referral recommendations provided, the most frequent recommendation was to attend further *enhance* counseling sessions ($n = 65$, 43.3%), followed by outpatient psychotherapy ($n = 30$, 20.0%) and psychosocial counseling services ($n = 29$, 19.3%). Referrals to a doctor were recommended in $n = 10$ (6.7%) cases. Less frequently recommended services included university counseling services, specialized counseling centers, and emergency services/SOP.

Differences in Follow-Up Responders and Non-Responders

A total of $n = 85$ participants completed the follow-up questionnaire and were therefore classified as responders. As shown in Tables 8–10, responders and non-responders did not differ significantly across any variables assessed at baseline, including experiences of discrimination.

However, the proportion of users was significantly higher among responders than among non-responders ($\chi^2 (1) = 9.624$, $p = 0.002$, Cramer's $V = 0.145$).

Table 5
Differences between Follow-Up Responders and Non-Responders at T0 (*n* = 455)

Variable (Mental Health Outcomes)	Responder Follow-Up (<i>n</i> = 85)	Non- Responder Follow-Up (<i>n</i> = 370)	95% Confidence Interval					
			T	<i>df</i>	<i>p</i>	Lower limit	Upper limit	Effect size (Hedges)
Age, <i>M</i> (<i>SD</i>)	24.09 (5.236)	24.20 (4.544)	0.183	453	0.855	-1.003	1.210	0.022
Current semester, <i>M</i> (<i>SD</i>)	7.22 (4.338)	8.15 (4.881)	1.617	114.801	0.867	-0.201	2.062	0.194
PHQ-9, <i>M</i> (<i>SD</i>)	20.706 (5.387)	21.895 (5.835)	1.717	453	0.087	-0.172	2.549	0.206
GAD-7, <i>M</i> (<i>SD</i>)	18.024 (4.372)	19.051 (4.791)	1.812	453	0.071	-0.087	2.143	0.218
EDE-Q8, <i>M</i> (<i>SD</i>)	21.706 (12.473)	23.327 (12.636)	1.069	453	0.238	-1.359	4.601	0.128
	(<i>n</i> = 57)	(<i>n</i> = 296)						
AUDIT-C, <i>M</i> (<i>SD</i>)	7.298 (2.187)	7.30 (2.390)	1.265	351	0.207	-0.239	1.102	0.183

Table 6
Differences between Follow-Up Responders and Non-Responders at T0 (*n* = 455)

Variable, <i>n</i> (%)	Responder Follow-Up (<i>n</i> = 85)	Non- Responder Follow-Up (<i>n</i> = 370)	Pearson's Chi square	<i>df</i>	<i>p</i>	Cramers's <i>V</i>
Gender, <i>n</i> (%)			3.610	2	0.164	0.089
Female	65 (65.2)	284 (76.8)				
Male	13 (15.3)	72 (19.5)				
Diverse	7 (8.2)	14 (3.8)				
History of migration, <i>n</i> (%)						
Immigrant	4 (4.7)	39 (10.5)	2.750	1	0.997	0.078
At least one parent is an immigrant	5 (5.9)	36 (9.7)	1.248	1	0.264	0.052
No history of migration	76 (69.9)	298 (80.5)	3.717	1	0.054	0.090
Living situation, <i>n</i> (%)			0.214	1	0.644	0.022
Alone	22 (25.9)	105 (28.4)				
With others	63 (74.1)	265 (71.6)				
Current monthly net income, <i>n</i> (%)			5.358	3	0.147	0.109
No personal income	21 (24.7)	57 (15.4)				
< 1000 €	40 (47.1)	187 (50.5)				
> 1000 €	21 (24.7)	118 (31.9)				
No information provided	3 (3.5)	8 (2.2)				
Targeted academic degree, <i>n</i> (%)			0.390	2	0.823	0.029
Bachelor	37 (43.5)	150 (40.5)				
Master (or equivalent degree, i.e. state exam or diploma)	40 (47.1)	188 (50.8)				
Other	8 (9.4)	32 (8.6)				
Relationship status, <i>n</i> (%)			4.409	2	0.110	0.098
Single	54 (63.5)	190 (51.4)				

Variable, <i>n</i> (%)	Responder Follow-Up (<i>n</i> = 85)	Non- Responder Follow-Up (<i>n</i> = 370)	Pearson's Chi square	<i>df</i>	<i>p</i>	Cramers's V
In a relationship	31 (36.5)	178 (48.1)				
Divorced	0 (0.00)	2 (0.5)				
Highest professional qualification of mother/ first parent, <i>n</i> (%)			0.639	3	0.887	0.037
Academic degree	35 (41.2)	148 (40.0)				
No academic degree	46 (54.1)	202 (54.6)				
Unknown	2 (2.4)	6 (1.6)				
No information provided	2 (2.4)	14 (3.8)				
Highest professional qualification of father/ second parent, <i>n</i> (%)			0.760	3	0.859	0.041
Academic degree	37 (43.5)	165 (44.6)				
No academic degree	44 (51.8)	179 (48.4)				
Unknown	2 (2.4)	14 (3.8)				
No information provided	2 (2.4)	12 (3.2)				
Use of services, <i>n</i> (%)			9.624	1	0.002	0.145
User	34 (40.0)	87 (23.5)				
Non-User	51 (60.0)	283 (76.5)				

Table 7

Differences between Follow-Up Responders and Non-Responders in experiences of discrimination at T0
(*n* = 71)

Experiences of discrimination, <i>n</i> (%)	Responder Follow-Up (<i>n</i> = 10)	Non-Responder Follow-Up (<i>n</i> = 61)	Pearson's Chi square	<i>df</i>	<i>p</i>	Cramers's V
Due to racism or nationality, <i>n</i> (%)			1.478	2	0.478	0.144
Yes	0 (0.0)	7 (11.5)				
No	10 (100)	53 (86.9)				
No information provided	0 (0.0)	1 (1.6)				
Due to gender, <i>n</i> (%)			0.904	3	0.824	0.113
Yes	5 (50.0)	23 (37.7)				
No	5 (50.0)	35 (57.4)				
No information provided	0 (0.0)	2 (3.3)				
Question skipped	0 (0.0)	1 (1.6)				
Due to gender identity, <i>n</i> (%)			2.635	3	0.451	0.193
Yes	0 (0.0)	1 (1.6)				
No	9 (90.0)	57 (93.4)				
No information provided	1 (10.0)	1 (1.6)				
Question skipped	0 (0.0)	2 (3.3)				
Due to religion or beliefs, <i>n</i> (%)			0.695	2	0.706	0.099
Yes	0 (0.0)	3 (4.9)				
No	10 (100.0)	57 (93.4)				
No information provided	0 (0.0)	1 (1.6)				
Due to an impairment or a disability, <i>n</i> (%)			0.624	3	0.891	0.094
Yes	1 (10.0)	8 (13.1)				
No	9 (90.0)	50 (82.0)				
No information provided	0 (0.0)	2 (3.3)				

Experiences of discrimination, <i>n</i> (%)	Responder Follow-Up (<i>n</i> = 10)	Non-Responder Follow-Up (<i>n</i> = 61)	Pearson's Chi square	<i>df</i>	<i>p</i>	Cramers's V
Question skipped	0 (0.0)	1 (1.6)				
Due to old age, <i>n</i> (%)			1.074	2	0.584	0.123
Yes	0 (0.0)	4 (6.6)				
No	10 (100.0)	55 (90.2)				
No information provided	0 (0.0)	2 (3.3)				
Due to young age, <i>n</i> (%)			1.074	3	0.783	0.123
Yes	0 (0.0)	4 (6.6)				
No	10 (100.0)	55 (90.2)				
No information provided	0 (0.0)	1 (1.6)				
Question skipped	0 (0.0)	1 (1.6)				
Due to sexual orientation, <i>n</i> (%)			2.661	3	0.447	0.194
Yes	3 (30.0)	7 (11.5)				
No	7 870.0)	52 (85.2)				
No information provided	0 (0.0)	1 (1.6)				
Question skipped	0 (0.0)	1 (1.6)				
Due to lower educational attainment, <i>n</i> (%)			0.882	3	0.830	0.111
Yes	0 (0.0)	2 (3.3)				
No	10 (100.0)	56 (91.8)				
No answer provided	0 (0.0)	1 (1.6)				
Question skipped	0 (0.0)	2 (3.3)				
Due to						
Due to low income, <i>n</i> (%)			0.894	3	0.827	0.112
Yes	1 (10.0)	5 (8.2)				
No	9 (90.09)	51 (83.6)				

Experiences of discrimination, <i>n</i> (%)	Responder Follow-Up (<i>n</i> = 10)	Non-Responder Follow-Up (<i>n</i> = 61)	Pearson's Chi square	<i>df</i>	<i>p</i>	Cramers's V
No information provided	0 (0.0)	4 (6.6)				
Question skipped	0 (0.0)	1 (1.6)				
Due to other reasons, <i>n</i> (%)			1.481	3	0.687	0.144
Yes	0 (0.0)	6 (9.8)				
No	9 (90.0)	48 (78.9)				
No information provided	1 (10.0)	5 (8.2)				
Question skipped	0 (0.0)	2 (3.3)				

Mental Health Measures at Baseline and Follow-Up

The results of the linear mixed-effects models are summarized in Table 8 and the corresponding estimated marginal means are presented in Table 9.

As the number of participants with complete data differed across the mental health measures, the effective sample size varied between analyses. In particular, fewer participants provided complete AUDIT-C data than for the other outcome measures, stating that they did not consume any alcohol, resulting in a smaller sample for the AUDIT-C analyses (*n* = 57) compared with the PHQ-9, GAD-7, and EDE-Q8 analyses (*n* = 85).

Significant main effects of time were observed for PHQ-9, GAD-7, and EDE-Q8 scores ($p(\text{PHQ-9}) < 0.001$, $p(\text{GAD-7}) < 0.001$, $p(\text{EDE-Q8}) = 0.025$), indicating reductions in depressive and anxiety symptoms as well as eating disorder pathology from baseline to follow-up for participants using the counseling services and those who did not. In contrast, neither the main effect of user status nor the Time*User interaction reached statistical significance for any of these outcomes (all $p > 0.05$). For AUDIT-C scores, no significant main or interaction effects were observed (all $p > 0.05$).

Table 8
Results of the linear mixed-effects models

Outcome	Time F (df 1, df 2)	p	User F (df 1, df 2)	p	Time * User F (df 1, df 2)	p
PHQ-9	20.518 (1, 91.442)	< 0.001	0.280 (1, 225.231)	0.597	1.789 (1, 91.442)	0.184
GAD-7	30.635 (1, 88.150)	< 0.001	0.156 (1, 197.530)	0.693	0.553 (1, 88.150)	0.459
EDE-Q8	5.203 (1, 87.781)	0.025	0.917 (1, 370.965)	0.339	0.517 (1, 87.781)	0.474
AUDIT-C	1.133 (1, 57.987)	0.292	1.212 (1, 216.372)	0.272	0.028 (1, 57.987)	0.867

Table 9
Estimated Marginal Means of the linear mixed-effect models

Outcome	Usage behavior	Baseline M (SE)	95% CI	Follow-up M (SE)	95% CI
PHQ-9	User	21.851 (0.525)	20.820–22.883	19.257 (0.741)	17.789–20.726
	Non-User	21.608 (0.316)	20.987–22.229	20.197 (0.577)	19.053–21.340
GAD-7	User	19.256 (0.430)	18.412–20.101	16.639 (0.694)	15.263–18.015
	Non-User	18.716 (0.259)	18.207–19.224	16.718 (0.544)	15.638–17.799
EDE-Q8	User	21.769 (1.145)	19.518–24.019	20.865 (1.300)	18.302–23.428
	Non-User	23.479 (0.689)	22.124–24.834	21.743 (0.921)	19.926–23.561
AUDIT-C	User	7.389 (0.209)	6.913–7.866	7.568 (0.209)	6.714–7.828
	Non-User	7.731 (0.146)	7.443–8.019	7.271 (0.281)	7.154–7.983

Sensitivity analyses using t-tests for paired samples confirmed the findings of the linear mixed-effects models. PHQ-9 scores decreased by a mean of 1.518 points ($SD = 4.322$; $t(84) = 3.237$, $p < 0.002$; 95% CI [0.585, 2.450]). Similar reductions were observed for GAD-7 ($M = 1.94$, $SD = 3.947$; $t(84) = 4.534$, $p < 0.001$; 95% CI [1.090, 2.792]) and EDE-Q8 ($M = 1.224$, $SD = 5.517$; $t(84) = 2.045$, $p = 0.044$; 95% CI [0.034,

2.414]). No significant change was observed for AUDIT-C ($M = 0.070$, $SD = 1.033$; $t(56) = 0.513$, $p = 0.610$; 95% CI [-0.204, 0.344]).

Referrals, Help-seeking Behavior and Barriers at Follow Up

The follow-up questionnaire included items assessing the outcomes of referral recommendations. A total of $n = 85$ participants responded to the question asking whether they had received a recommendation to contact a specific service or provider during their participation in the support service. Of these, $n = 18$ participants (21.2%) reported receiving one recommendation, $n = 19$ (22.4%) reported receiving multiple recommendations, and $n = 48$ (56.5%) indicated that they had not received a referral recommendation. $N = 60$ participants responded to the question regarding whether they had contacted the recommended service or provider. Most participants ($n = 48$, 80.0%) reported that they had not established contact with the recommended service or provider.

Among the $n = 12$ students who initiated contact with the recommended service or provider, four (33.3%) had already attended their appointment or consultation, while two (16.7%) had scheduled an appointment that had not yet taken place. Among those who did not pursue the referral recommendation, the most commonly reported reason was the lack of available appointments or excessively long waiting lists ($n = 4$, 33.3%), followed by was being unable to reach the recommended service ($n = 3$, 25.0%). Two participants (16.7%) also indicated that contacting the service did not feel right.

When evaluating how the service supported participants in following the referral recommendation, the factor most frequently selected was that participants felt encouraged to take this step ($n = 11$, 91.7%), with having gained a clearer understanding of their problem ($n = 9$, 75.0%), feeling that they had someone by their side to support them ($n = 9$, 75.0%), and knowing where to seek help ($n = 9$, 75.0%) ranking second. In addition, eight participants ($n = 66.7\%$) reported having developed a clear plan for seeking support, while seven ($n = 58.3\%$) stated that they had received information they had not previously had. Half of the participants ($n = 6$, 50.0%) further indicated that the support service had helped them realize that they could change their situation themselves.

Out of the $n = 37$ participants receiving at least one referral recommendation, 16 (43.2%) answered the questionnaire regarding barriers to contacting the recommended service or provider. The most commonly reported barriers were not having had the time yet ($n = 11$, 68.8%) and not feeling comfortable talking to a stranger about their concerns ($n = 10$, 62.5%). Additionally, six participants (37.5%) reported believing that the problem was their own responsibility and could be managed independently, five (31.3%) indicated that they were afraid of being admitted to a psychiatric hospital and four participants (25%) reported being concerned what others might think or say about them as well as having sought help elsewhere.

Non-Use Questionnaire

Out of a total of $n = 82$ participants, $n = 71$ selected one predefined response option to indicate their reasons for non-use. The most frequently reported reasons were lack of motivation and not having

enough time to use the online support service ($n = 20$, 24.4% each), followed by having used the app and no longer requiring further support ($n = 11$, 13.4%) and having forgotten to participate in the study ($n = 7$, 8.5%).

Free-text responses were analyzed using MAXQDA. The most frequently identified reasons for non-use were poor physical or mental health ($n = 7$, 15.9%), technical issues ($n = 5$, 12.2%), and not feeling ready to participate in counseling sessions ($n = 5$, 12.2%). Other commonly reported reasons included lack of time ($n = 4$, 9.8%) and technical accessibility barriers ($n = 4$, 9.8%).

The qualitative analysis further identified several reasons for non-use that were not represented in the predefined response options, which are presented in Table 10.

Integrating the free-text responses into the predefined response categories resulted in only minor changes to the overall distribution of reasons for non-use. After combining both sources of information, lack of time emerged as the most frequently reported reason ($n = 23$, 26.7%), followed by lack of motivation ($n = 21$, 24.4%) and no longer requiring additional support after using the app ($n = 14$, 16.3%).

Table 10
Reasons for non-use of the counseling services provided in the Follow-Up questionnaire.

Predefined reasons	Predefined response options, <i>n</i> = 71	<i>N</i> (%)	Free-text responses, <i>n</i> = 45	<i>N</i> (%)	Predefined response options combined with free-text responses, <i>n</i> = 86 <i>N</i> (%)
	I am using the <i>enhance</i> app and do not need any additional support.	11 (13.4)		3 (6.7)	14 (16.3)
	I do not like the content provided by the online-based support service.	3 (3.7)		1 (2.2)	6 (7.0)
	I feel better and no longer need support.	4 (4.9)		2 (4.4)	6 (7.0)
	I do not think that the service will help me.	3 (3.7)			4 (4.7)
	I lack the motivation to use an online-based support service.	20 (24.4)			21 (24.4)
	I do not have time to use an online-based support service.	20 (24.4)		4 (8.9)	23 (26.7)
	I forgot that I had signed up for the study.	7 (8.5)			7 (8.1)
	I do not receive money for participating in the study.	1 (1.2)			1 (1.2)
	Using the support services required too much effort.	4 (4.9)			4 (4.7)
Additional reasons identified in the free-text responses			Just trying the out the service	1 (2.2)	

Predefined reasons	Predefined response options, <i>n</i> = 71	<i>N</i> (%)	Free-text responses, <i>n</i> = 45	<i>N</i> (%)	Predefined response options combined with free-text responses, <i>n</i> = 86 <i>N</i> (%)
	I am using the <i>enhance</i> app and do not need any additional support.	11 (13.4)		3 (6.7)	14 (16.3)
			Technical difficulties	5 (11.1)	
			Not feeling ready to use the service	5 (11.1)	
			Low technical accessibility	4 (8.9)	
			Perceived barriers for usage	3 (6.7)	
			Poor mental health	8 (17.8)	
			Poor physical health	1 (2.2)	
			Not wanting to talk to strangers	2 (4.4)	

In addition, participants had the opportunity to specify in a free-text field where they had sought support elsewhere. Seven participants (8.5%) provided a response. Two participants each reported seeking support from their local student services organization (*n* = 2, 2.4%) and the psychosocial counseling service at their university (*n* = 2, 2.4%). Other reported sources of support included an ADHD diagnostic center (*n* = 1, 1.2%) and the combination of a psychiatric outpatient clinic, outpatient psychotherapy, an aftercare group at a psychiatric day hospital and supported independent living (*n* = 1, 1.2%). Additionally, one participant (*n* = 1, 1.2%) indicated only wanting to try out the services and not having any problems.

Discussion

The present findings suggest that the *enhance* program provides a low-threshold intervention for psychologically distressed university students. Given the growing demand for services such as *enhance*, it is particularly important to better understand the population engaging with these interventions, including their usage patterns, mental health outcomes, help-seeking behavior, and the barriers they

experience. Such insights may contribute to improving digital mental health services and tailoring them more closely to the needs of their users.

Participants had a mean age of 24 years and women represented the majority of the sample, which is consistent with previous research showing that female college students are more likely to perceive a need for mental health treatment and to utilize mental health services [15]. A substantial proportion of students also reported a monthly income of less than 1000 €. Given that financial stress has been associated with poorer mental health among university students, limited financial resources may represent an additional challenge for their psychological well-being [16].

Another notable characteristic of the sample was that the majority of participants reported that both of their parents did not hold an academic degree. Although first-generation student status was not assessed directly, this finding may suggest that a substantial proportion of the sample consisted of first-generation university students. Previous research has shown that first-generation students report higher levels of financial stress and are less likely to utilize mental health services than continuing-generation students, despite having comparable levels of mental health symptoms [17]. Digital support services such as *enhance* may therefore be particularly relevant for this group by providing an easily accessible alternative to traditional mental health services.

Although experiences of discrimination were reported by only a minority of participants in our sample, their potential relevance to student mental health should not be overlooked. Experiences of discrimination have been associated with poorer mental health outcomes among university students, including a higher prevalence of diagnosed mental illness and elevated PHQ-9 and GAD-7 scores. [18].

Help-seeking intentions were generally high, with more than 80% of students indicating that they were likely or very likely to seek psychotherapeutic treatment or psychological or psychosocial counseling if needed. In contrast, previous utilization of mental health services was considerably lower, although most participants were aware of local support services like the Central Student Advisory Service and psychological or psychosocial counseling services. Awareness of digital support services was substantially lower, with only 36% of participants reporting familiarity with these services at their university. Notably, approximately 90% indicated that they had never used digital support services, suggesting that *enhance* may have reached a population largely new to digital help-seeking. As many students with mental health problems do not receive adequate treatment despite being a particularly vulnerable population [4], these findings highlight the general need for low-threshold support services, including online-based interventions like *enhance*. Digital mental health interventions may represent an additional pathway to support, as almost half of German university students reported willingness to use internet- or mobile-based interventions, with self-help internet interventions showing higher acceptance among students with mental disorders than among those without mental disorders [19].

The comparison between responders and non-responders in the follow-up showed no statistically significant differences in sociodemographic characteristics, experiences of discrimination and psychological distress. However, participants defined as users were significantly more likely to respond

to the follow-up questionnaire. The lower response rate among students who did not use the offered services may be related to lower engagement with the intervention. Consistent with this finding, a previous study reported a positive association between adherence to an online intervention and retention, suggesting that participants with greater adherence were more likely to provide follow-up data [20].

Depressive symptoms, anxiety symptoms, and disordered eating decreased significantly over the course of the study. However, neither the main effect of user status nor the interaction between time and user status was statistically significant, suggesting that participation in at least one counseling session was not associated with greater improvements in mental health outcomes over the six-week follow-up period. Although psychological symptoms decreased over time, the extent of this improvement did not differ significantly between participants who engaged with counseling and those who did not. These findings were confirmed by the sensitivity analyses.

While these differences were not statistically significant, descriptive patterns differed across outcomes. Although the differences were not statistically significant, users initially showed higher levels of depressive and anxiety symptoms than participants defined as non-users but lower levels at follow-up, whereas the opposite pattern was observed for disordered eating and alcohol use. Given the non-significant interactions between time and user status, these descriptive patterns should be interpreted cautiously and do not provide evidence of differential changes between students, who participated in counseling sessions and those who did not. Potential floor effects may also have limited observable symptom change, particularly among participants whose baseline scores were already close to the lower boundaries of the respective scales [21].

One possible explanation for the absence of significant differences based on counseling participation may be the varying number of sessions attended. Participants were classified as users after attending at least one session, regardless of the total number of sessions completed. Thus, for participants who attended only a small number of sessions, the level of exposure may have been insufficient to result in measurable changes in symptom severity within the timespan of the study. This hypothesis is consistent with existing evidence suggesting that approximately seven to 11 sessions may be required to achieve clinically significant symptom improvement and that a greater number of therapy sessions is generally associated with better outcomes, although the extent of improvement per session may vary across therapists and patients [22, 23]. At the same time, single-session interventions have gained attention as a promising low-threshold approach to providing mental health support for young adults [24, 25].

The classification based on counseling participation should also be considered when interpreting the observed mental health outcomes, as it did not account for app usage. Participants who did not attend counseling sessions may still have engaged with the app and potentially benefited from its features.

This may have reduced differences in mental health outcomes between the two groups, as digital mental health interventions, including mobile apps, have previously been shown to improve psychological outcomes among university students [26, 7]. Further research could examine counseling and app

engagement separately to determine whether and to what extent each component contributes to changes in mental health outcomes.

Given the self-selected study design, the extent to which the observed changes can be attributed to counseling participation remains uncertain, despite previously observed similarities in baseline characteristics across counseling participation groups.

Despite approximately half of the follow-up responders having received at least one referral recommendation, only one third reported contacting the recommended service or provider. This relatively low referral uptake aligns with evidence showing lower engagement following electronic referrals compared with warm handoffs, in which the referring provider actively supports the transition to further care [27]. Greater integration of services and a personal introduction to the new provider may also help reduce hesitancy to engage in subsequent treatment [28]. The most frequently recommended services were further counseling sessions with *enhance* outpatient psychotherapy and psychosocial counseling services. While the counseling sessions are generally designed to provide low-threshold support, accessing outpatient psychotherapy in Germany may involve rather long waiting times and other barriers [29], which could increase hesitancy to seek further treatment.

Participants who followed the referral recommendation indicated that they felt encouraged to do so, gained a clearer understanding of their problems, felt supported throughout the process, and had developed a clear plan for seeking further help. These facilitating factors suggest that the low-threshold character of the counseling sessions may promote help-seeking by providing students with guidance and support in accessing further care.

Among students who did not contact the recommended service and completed the questionnaire on barriers to help-seeking, the most reported barriers were not having had enough time to initiate contact and feeling uncomfortable discussing their concerns with a stranger. Additional barriers included believing that they should manage their problems on their own, fear of psychiatric hospitalization, concerns about what others might think or say about them, and having sought help elsewhere. These barriers are in line with existing evidence and suggest that both practical constraints and personal attitudes toward help-seeking may interfere with access to further mental health care, even after students have received a specific referral recommendation [30].

Regarding reasons for non-use, lack of time and motivation emerged as the most reported barriers among participating students. These findings suggest that non-use was primarily related to practical and motivational barriers rather than a general rejection of the support service and correspond with research identifying time constraints as an important obstacle to adherence with digital mental health interventions and highlighting personal motivation as a relevant factor for sustained engagement [31].

Further reasons for non-use identified from the free-text responses included poor physical or mental health, with some participants reporting that they felt too stressed or depressed to engage with the service. Others indicated that they did not yet feel ready to participate in counseling. These responses

suggest that psychological distress itself may, in some cases, interfere with engagement, potentially making it more difficult for students to take up offers of support despite a need for help. Technical issues and barriers were also identified in the free-text responses, including difficulties using the app and counseling session platforms and not wanting to download an additional application. Similar challenges have been reported for other digital mental health interventions, with technical issues identified as a common barrier to engagement [32].

Some participants reported seeking support from other university-based or specialized mental health services, showing that non-use of the service did not always mean an absence of help-seeking. Given the small number of responses, however, no broader conclusions regarding alternative help-seeking pathways can be drawn.

Limitations

Several limitations need to be considered when interpreting the findings of this study. Participation was voluntary, which may have resulted in self-selection, as students choosing to participate in a digital mental health program may differ from those who do not participate. Furthermore, the lack of random assignment makes it difficult to determine to what extent the observed changes in mental health outcomes can be linked to the intervention. The use of self-report measures may also have influenced the findings, as responses could be affected by factors such as the tendency to provide socially acceptable answers or differences in how participants perceive and report their symptoms.

An additional consideration is that the linear mixed-effects models did not explicitly account for potential floor and ceiling effects. Given the bounded ranges of the outcome measures, participants scoring near the lower or upper limits had restricted room for further change in that direction. As floor and ceiling effects were not specifically examined in the present study, their potential influence on the observed changes cannot be ruled out.

The high dropout rate may have resulted in selective loss to follow-up, particularly as participants who attended counseling sessions were more likely to complete the follow-up assessment than those who did not. The resulting small follow-up sample and unequal group sizes may also have reduced the statistical power to detect differences based on counseling participation.

Due to the relatively short follow-up period, covering a timespan of only six weeks, the assessment of the longer-term course of the observed changes could be limited. It should also be noted that user status was based solely on participation in at least one counseling session and did not account for the number of sessions attended or engagement with the app.

Conclusion

Enhance is a digital mental health program that supports university students experiencing psychological difficulties through brief counseling sessions and referrals to specialized services when further care is

required. The participants showed high levels of psychological distress across the mental health measures, particularly regarding symptoms of depression and anxiety. Overall, symptoms of depression, anxiety, and disordered eating decreased over time, although these changes did not differ significantly based on counseling participation. However, findings from the follow-up assessment of help-seeking behavior suggest that the counseling sessions may still serve an important function by providing participants with guidance and orientation, supporting access to further care, and making them feel less alone with their psychological distress. Regarding reasons for non-use, lack of time and motivation as well as technical factors were identified as relevant factors influencing engagement with the service. Addressing these factors may provide an important starting point for the further development and improvement of digital mental health services for university students.

Declarations

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Ethics statement

Approval for this study was granted by the ethics committee of the Medical Faculty of Leipzig University on 15 August 2022 (file reference: 276/22-ek) in accordance with the Declaration of Helsinki.

Generative AI Statement

The author(s) declare that generative AI tools were used in the preparation of this manuscript. OpenAI was used for language assistance, including grammar, wording and style improvements.

Consent to Participate declaration

Informed consent was obtained from all subjects involved in the study.

Conflict of Interest

AS, JH, EK, ASP and CR-K confirm no conflicting interests.

Author Contributions

JH, EK, and CR-K designed the study. AS and JH prepared the dataset and performed the statistical analysis. AS drafted the article. JH, EK, ASP, and CR-K discussed the results and contributed to the final

manuscript. All authors discussed the results and contributed to the final manuscript. All authors have approved the final manuscript.

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References

1. (2022) Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Psychiatry* 9:137–50. [https://doi.org/10.1016/S2215-0366\(21\)00395-3](https://doi.org/10.1016/S2215-0366(21)00395-3)
2. Wang Z, Dou Y, Yang X, et al. Global, regional, and national burden of mental disorders among adolescents and young adults, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. *Transl Psychiatry*. 2025;15:397. <https://doi.org/10.1038/s41398-025-03623-w>.
3. Thapar A, Eyre O, Patel V, et al. Depression in young people. *Lancet*. 2022;400:617–31. [https://doi.org/10.1016/S0140-6736\(22\)01012-1](https://doi.org/10.1016/S0140-6736(22)01012-1).
4. Auerbach RP, Alonso J, Axinn WG, et al. Mental disorders among college students in the World Health Organization World Mental Health Surveys. *Psychol Med*. 2016;46:2955–70. <https://doi.org/10.1017/S0033291716001665>.
5. Kohls E, Guenthner L, Baldofski S, et al. Two years COVID-19 pandemic: Development of university students' mental health 2020–2022. *Front Psychiatry*. 2023;14:1122256. <https://doi.org/10.3389/fpsy.2023.1122256>.
6. Mofatteh M. Risk factors associated with stress, anxiety, and depression among university undergraduate students. *AIMS Public Health*. 2021;8:36–65. <https://doi.org/10.3934/publichealth.2021004>.
7. Lattie EG, Adkins EC, Winkquist N, et al. Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review. *J Med Internet Res*. 2019;21:e12869. <https://doi.org/10.2196/12869>.
8. Smith KA, Ward T, Lambe S, et al. Engagement and attrition in digital mental health: current challenges and potential solutions. *NPJ Digit Med*. 2025;8:398. <https://doi.org/10.1038/s41746-025-01778-w>.
9. Taylor ME, Liu M, Abelson S, et al. The Reach, Effectiveness, Adoption, Implementation, and Maintenance of Digital Mental Health Interventions for College Students: A Systematic Review. *Curr Psychiatry Rep*. 2024;26:683–93. <https://doi.org/10.1007/s11920-024-01545-w>.
10. Mestdagh M, Verdonck S, Piot M, et al. m-Path: an easy-to-use and highly tailorable platform for ecological momentary assessment and intervention in behavioral research and clinical practice. *Front Digit Health*. 2023;5:1182175. <https://doi.org/10.3389/fdgth.2023.1182175>.

11. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001;16:606–13. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>.
12. Spitzer RL, Kroenke K, Williams JBW, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166:1092–7. <https://doi.org/10.1001/archinte.166.10.1092>.
13. Kliem S, Mößle T, Zenger M, et al. The eating disorder examination-questionnaire 8: A brief measure of eating disorder psychopathology (EDE-Q8). *Int J Eat Disord.* 2016;49:613–6. <https://doi.org/10.1002/eat.22487>.
14. Bush K, Kivlahan DR, McDonell MB, et al. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Arch Intern Med.* 1998;158:1789–95. <https://doi.org/10.1001/archinte.158.16.1789>.
15. Pei J, Amanvermez Y, Vigo D, et al. Sociodemographic Correlates of Mental Health Treatment Seeking Among College Students: A Systematic Review and Meta-Analysis. *Psychiatr Serv.* 2024;75:556–69. <https://doi.org/10.1176/appi.ps.20230414>.
16. Smith BW, Della Maneze, Ramjan LM, et al. Impacts of Financial Stress on Mental Health and Wellbeing of Nursing Students: A Systematic Integrative Review. *J Adv Nurs.* 2026;82:2766–89. <https://doi.org/10.1111/jan.70043>.
17. Lipson SK, Diaz Y, Davis J et al. (2023) Mental health among first-generation college students: Findings from the national Healthy Minds Study, 2018–2021. *Cogent Ment Health* 2. <https://doi.org/10.1080/28324765.2023.2220358>
18. Endres KJ, Da Silva Prado A, Klemm S-L, et al. Psychosocial burden of discrimination based on sexual orientation in university students-A cross-sectional analysis. *Front Public Health.* 2026;14:1799079. <https://doi.org/10.3389/fpubh.2026.1799079>.
19. Kählke F, Hasking P, Küchler A-M, et al. Mental health services for German university students: acceptance of intervention targets and preference for delivery modes. *Front Digit Health.* 2024;6:1284661. <https://doi.org/10.3389/fdgth.2024.1284661>.
20. Murray E, White IR, Varagunam M, et al. Attrition revisited: adherence and retention in a web-based alcohol trial. *J Med Internet Res.* 2013;15:e162. <https://doi.org/10.2196/jmir.2336>.
21. Doering S, Herpertz S, Pape M, et al. The multicenter effectiveness study of inpatient and day hospital treatment in departments of psychosomatic medicine and psychotherapy in Germany. *Front Psychiatry.* 2023;14:1155582. <https://doi.org/10.3389/fpsy.2023.1155582>.
22. Chen B, Keenan-Miller D. How much therapy is enough? The dose-response effect and its moderators in a psychology training clinic. *J Clin Psychol.* 2021;77:20–35. <https://doi.org/10.1002/jclp.23025>.
23. Saxon D, Firth N, Barkham M. The Relationship Between Therapist Effects and Therapy Delivery Factors: Therapy Modality, Dosage, and Non-completion. *Adm Policy Ment Health.* 2017;44:705–15. <https://doi.org/10.1007/s10488-016-0750-5>.

24. Schleider JL, Dobias ML, Sung JY, et al. Future Directions in Single-Session Youth Mental Health Interventions. *J Clin Child Adolesc Psychol*. 2020;49:264–78.
<https://doi.org/10.1080/15374416.2019.1683852>.
25. Wehlage C, Zivanovic S, Koechlin H, et al. A Compassion-Focused Online Single-Session Intervention to Reduce Academic Stress in University Students: Protocol for a Randomized Controlled Trial. *JMIR Res Protoc*. 2026;15:e83850. <https://doi.org/10.2196/83850>.
26. McCloud T, Jones R, Lewis G, et al. Effectiveness of a Mobile App Intervention for Anxiety and Depression Symptoms in University Students: Randomized Controlled Trial. *JMIR Mhealth Uhealth*. 2020;8:e15418. <https://doi.org/10.2196/15418>.
27. Anand P, Desai N. Correlation of Warm Handoffs Versus Electronic Referrals and Engagement With Mental Health Services Co-located in a Pediatric Primary Care Clinic. *J Adolesc Health*. 2023;73:325–30. <https://doi.org/10.1016/j.jadohealth.2023.02.032>.
28. Fountaine AR, Iyar MM, Lutes LD. Examining the Utility of a Telehealth Warm Handoff in Integrated Primary Care for Improving Patient Engagement in Mental Health Treatment: Randomized Video Vignette Study. *JMIR Form Res*. 2023;7:e40274. <https://doi.org/10.2196/40274>.
29. Kruse J, Kampling H, Bouami SF, et al. Outpatient Psychotherapy in Germany—an Evaluation of the Structural Reform. *Dtsch Arztebl Int*. 2024;121:315–22.
<https://doi.org/10.3238/arztebl.m2024.0039>.
30. Zhao R, Amanvermez Y, Pei J, et al. Research Review: Help-seeking intentions, behaviors, and barriers in college students - a systematic review and meta-analysis. *J Child Psychol Psychiatry*. 2025;66:1593–605. <https://doi.org/10.1111/jcpp.14145>.
31. Renfrew ME, Morton DP, Northcote M, et al. Participant Perceptions of Facilitators and Barriers to Adherence in a Digital Mental Health Intervention for a Nonclinical Cohort: Content Analysis. *J Med Internet Res*. 2021;23:e25358. <https://doi.org/10.2196/25358>.
32. Borghouts J, Eikey E, Mark G, et al. Barriers to and Facilitators of User Engagement With Digital Mental Health Interventions: Systematic Review. *J Med Internet Res*. 2021;23:e24387.
<https://doi.org/10.2196/24387>.

Figures

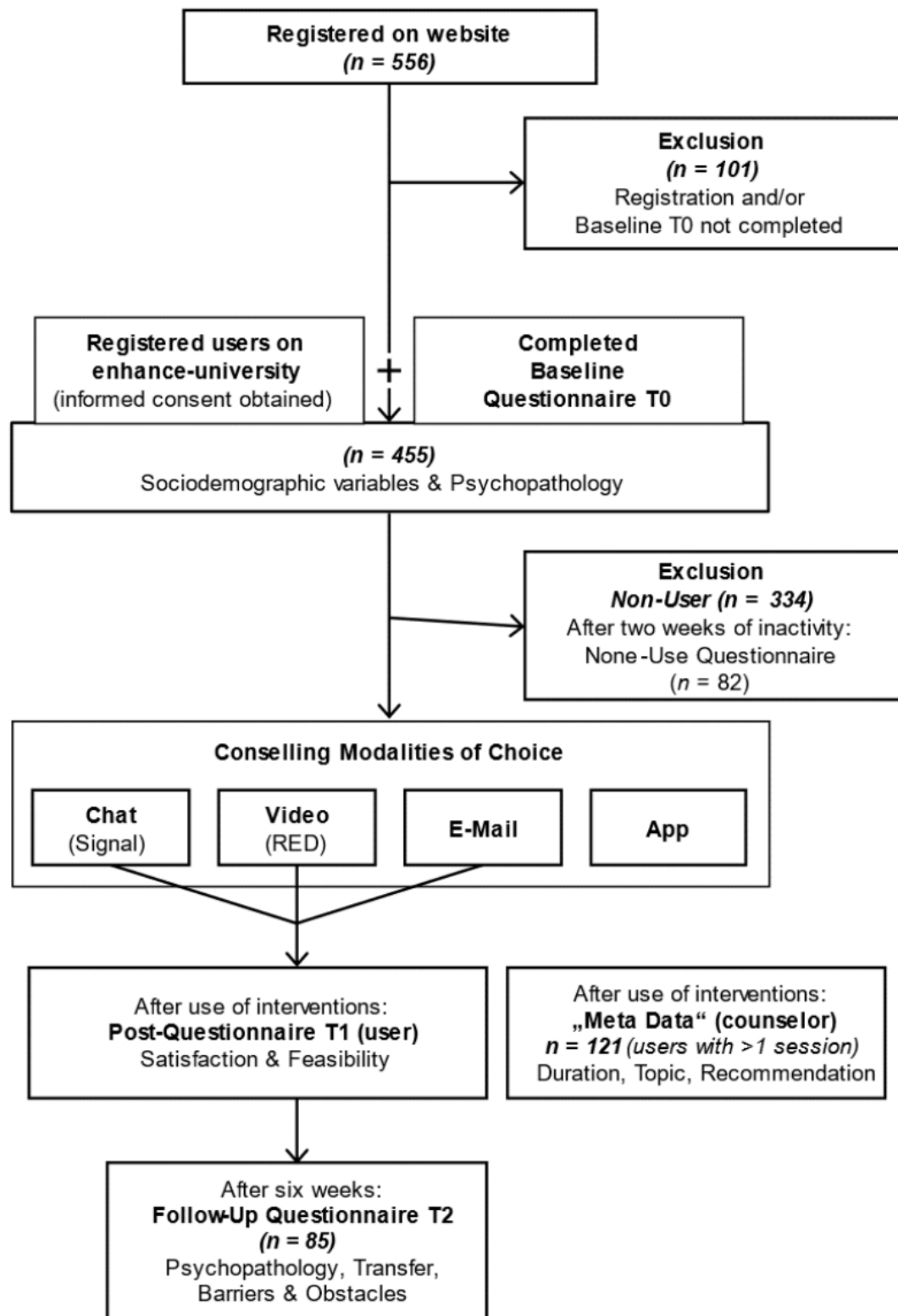


Figure 1

Participant flow and uptake of the interventions.