

Fostering resilience during the COVID-19 pandemic via a digital mental health intervention—A pilot study

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Abstract

During the coronavirus disease 2019 (COVID-19) pandemic, mental health burden of university members sharply increased. Specific interventions to address pandemic-related psychological distress did not yet exist. Current studies show that digital interventions reduce this burden, the investigation of changes in resilience as an outcome is lacking in these studies though. We therefore developed and evaluated the internet- and mobile-based intervention “bounce” to foster resilience, reduce perceived stress, and psychological symptom burden among university members during the pandemic. The 8-week, unguided internet- and mobile-based intervention consists of one mandatory module promoting resilience and six optional modules on pandemic-related topics. The study was designed as a one-arm, longitudinal pilot study with a baseline and postintervention assessment and self-reported resilience, perceived stress, and psychological symptom burden as outcome measures. The use and acceptance of the intervention modules were recorded and analyzed. A total of 798 individuals were given access to the intervention ($n = 70$ employees, $n = 728$ students, $M = 26.05$ years, 71.8% women). Of these, 273 participants (34%) completed the postassessment. On average, participants logged on to the intervention platform four times and completed an average of 1.90 ($SD = 1.64$) modules. The intervention as a whole and all modules were well accepted by participants. Intention-to-treat analyses showed a significant increase in resilience ($t = -4.69$, $p < 0.001$, $d = 0.23$) and a significant reduction in perceived stress ($t = 6.50$, $p < 0.001$, $d = 0.32$), and psychological symptom burden ($t = 3.59$, $p < 0.001$, $d = 0.18$) from baseline to postintervention. This study demonstrates that digital interventions can be easily developed and used as means to reduce mental health burden in large populations during a pandemic. The need for randomized controlled trials with follow-up assessments to examine longer-term effects and revisions of the intervention to increase effectiveness and use are discussed.

KEYWORDS

COVID-19 pandemic, digital mental health intervention, faculty, prevention, psychological resilience, psychological stress, students

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1 | INTRODUCTION

Soon after the outbreak of the coronavirus disease 2019 (COVID-19) pandemic (WHO, 2020), meta-analytic research demonstrated an increase in psychological symptoms such as depression and anxiety across the world (Kunzler et al., 2021). Hajek et al. (2022) found that one-fifth of German individuals experienced symptoms of depression and anxiety during the winter of 2020/2021. A particularly high prevalence rate was found among 18–29-year-olds (approximately 40%; Hajek et al., 2022). Moreover, increased levels of depression, anxiety, and stress were associated with negative changes in physical activity (49%), sleep (41%), and substance consumption (34%) during the pandemic (Hetkamp et al., 2020). Working and studying from home was a mandatory restriction for many university members, which affected their well-being. For example, Brazilian university staff working from home during the pandemic were reported to experience increased workload, digital fatigue, concerns about productivity, their work–life balance, and even losing their jobs (Serralta et al., 2020). In a study from Australia in the spring of 2020, up to a quarter of university staff reported moderate-to-severe symptoms of depression, anxiety, and stress (Parker et al., 2022). In the United States, students reported being more stressed, having an increased consumption of alcohol, and having more symptoms of mood disorders compared to a cohort in the fall of 2019 (Charles et al., 2021). According to a systematic review by Xiong et al. (2020), younger age, female gender, being a student, and unemployment are associated with higher psychological distress during the pandemic. Therefore, university students and staff may have been particularly vulnerable to psychological symptom burden during this time.

Psychological distress together with other vulnerabilities can promote the onset of mental disorders (Taylor, 2019). Building up resilience, on the other hand, may help to maintain mental health and protect a person from negative effects of pandemic-related stressors (Chmitorz, Kunzler, et al., 2018; Taylor, 2019). Resilience is usually defined as composed of different factors such as active coping, self-efficacy, optimism, a positive attributional style, social support, and cognitive flexibility (Helmreich et al., 2017). Since resilience can be improved by training (Linz et al., 2020), digital interventions fostering resilience could possibly help to deal with the COVID-19 pandemic.

Evidence of interventions to foster resilience is inconclusive thus far. While one meta-analysis found an overall effect of Hedge's $g = 0.48$ for resilience interventions in online and offline formats (Liu et al., 2020), another meta-analysis examining digital resilience interventions was not able to confirm this (Hedge's $g = 0.12$; Diaz-Garcia et al., 2021). Both meta-analyses revealed potential publication bias and high variability in terms of resilience definitions, target groups, types of stress exposure, intervention approaches, and effect sizes between and within studies. The investigated studies indicated encouraging effects on resilience outcomes when based on an appropriate theoretical foundation of resilience.

Considering restrictions for personal contact, digital interventions emerged as a necessary approach, but were lacking shortly after the start of the pandemic. Later, several studies investigated the

effects of digital interventions during the pandemic and partly involved university members as a target group. These studies found significant decreases in depression, anxiety, and perceived stress with small to medium effect sizes compared to a control condition (Bruhns et al., 2021; Fassnacht et al., 2022; He et al., 2022; Kanter et al., 2021; Lahtinen et al., 2021; Riboldi et al., 2023; Song et al., 2021; Sun et al., 2022; Theurel et al., 2022; Wei et al., 2020). Notably, resilience has hardly been included as an outcome measure in those studies. Therefore, the goal of our pilot study was to develop an internet- and mobile-based intervention for university members to foster their resilience, and to investigate whether this intervention can affect resilience, perceived stress, and psychological symptom burden during the COVID-19 pandemic. Additionally, we aimed to examine the reach, use, and acceptance of the intervention.

2 | METHODS

2.1 | Study design

We conducted a longitudinal, uncontrolled pilot study with a baseline and postintervention assessment. To be eligible for the study, participants had to meet the following inclusion criteria: informed consent, status as student or employee at TU Dresden, ≥ 18 years old, and internet access. Exclusion criteria were self-reported substance use problems or psychotic illness, acute suicidality, and current or recently completed psychotherapeutic or psychiatric treatment within the last 4 weeks. Participants could withdraw their consent at any time during the study without giving a reason.

2.2 | Recruitment

Recruitment of participants started in December 2020 and ended in December 2022. The study sample includes participants recruited until the end of March 2021. Due to a limited number of registrations following initial data analysis, we chose this subsample, which allowed us to study a time period with highest restrictions and without additional temporal influences. Recruitment took place via mailing lists for students, faculty and employees, student and student union newsletters, social media posts on Facebook, the psychology department's webpage, lectures, and an article in the university journal. Psychology students at TU Dresden were offered course credit for participation in the assessments and intervention.

2.3 | Procedure

All aspects of the study were conducted online. After consenting and completing the screening for eligibility, participants were asked to complete the baseline assessment and provide a pseudonymous email address, which was used to create a password-protected user account on the Minddistrict e-Health platform (Minddistrict GmbH)

to access the intervention. Eight weeks past the baseline, participants received invitations and reminders for the postintervention assessment via email. This time interval was chosen to allow participants to complete the intervention within the suggested timeframe.

2.4 | Intervention

The intervention “bounce” was provided on the Minddistrict e-Health platform, offering an app- and browser-based use of the intervention. In an initial beta test, eight students and employees of TU Dresden received a questionnaire addressing the criteria of usability, completeness, and comprehensibility of the intervention. Beta testers overall gave positive feedback. Their comments and suggestions were used to revise and finalize the intervention.

The intervention was offered as a universal prevention program and comprised seven modules covering different topics to foster resilience in the context of the COVID-19 pandemic. The intervention content was developed on the basis of the taxonomy of behavior change techniques by Abraham and Michie (2008). Specifically, the intervention contains psychoeducational content, cognitive behavioral techniques, resilience topics such as coping, optimism, positive reappraisal, and social support, as well as pandemic-related topics, for example, acceptance, mindfulness, physical activity, nutrition, alcohol consumption, sleep, goal setting techniques, behavioral activation, and media and health literacy. Table 1 gives an overview of the modules and content. The introductory module on resilience was defined as a mandatory module and available on the participants' start page after logging on. Participants were able to freely choose from the remaining six modules based on their interests and needs. These six modules are nonchronological, that is, it can be worked through in any order. Reading time for each module was about 15 min, but could be up to 30 min, when taking time for exercises into account. We advised participants to complete one module per week, to allow time for practice and consolidation. Each module offered a diary for reflection, text, interactive exercises, quizzes, and customizable content, for example, free text fields or closed questions to encourage self-reflection. Some modules also provided website links,

videos, and audio files. The intervention was unguided, but participants received technical support if needed. Participants also received reminders about unfinished modules via email.

2.5 | Outcomes/measures

Sociodemographic variables such as age, gender, educational background, marital status, employment/student status at TU Dresden, weekly working hours, and monthly net income were collected at baseline. Intervention use, that is, the frequency of logons via app or browser and the number of opened and completed modules were tracked automatically on the intervention platform. Acceptance of the intervention was measured via ratings of the intervention and individual modules on a five-point Likert scale from not at all (1) to excellent (5) at the end of each module and at postassessment. Participants also rated the length of each module and were asked for their personal feedback.

Mental health outcomes were assessed at baseline and post-assessment. The German version of the Brief Resilience Scale (BRS; Chmitorz, Wenzel, et al., 2018) was used to measure self-reported resilience. The scale demonstrated good convergent and discriminant validity, internal consistency, and composite reliability ($\alpha = 0.85$ and $\omega = 0.85$ for both samples; Chmitorz, Wenzel, et al., 2018) in a population-based sample ($n = 1481$) and a population-representative sample ($n = 1128$). Perceived stress was assessed with the German version of the Perceived Stress Scale-10 (PSS-10; Schneider et al., 2020). A multiple confirmatory factor analysis on 575 clinical and 1248 nonclinical participants confirmed an excellent one-factor model fit. Internal consistency ($\alpha = 0.88$ for nonclinical participants, $\alpha = 0.89$ for clinical participants) was good (Schneider et al., 2020). The German version of the ultrashort form of the Patient Health Questionnaire-4 (PHQ-4; Löwe et al., 2010) was used to assess depression and anxiety symptoms. The PHQ-4 has good construct validity and internal consistency ($\alpha = 0.78$; Löwe et al., 2010). Internal consistency for the bounce sample was good (BRS-pre: $\alpha = 0.80$, BRS-post: $\alpha = 0.79$; PSS-10-pre: $\alpha = 0.85$, PSS-10-post: $\alpha = 0.86$; PHQ-4-pre: $\alpha = 0.75$, PHQ-4-post: $\alpha = 0.74$).

TABLE 1 Content of the seven intervention modules of bounce.

Module	Topics
Resilience	Introduction to the intervention, coping with crises, acceptance, optimism, positive reappraisal, social support, coping with stress, recognizing own strengths
Self-care I	Physical activity, balanced nutrition, alcohol consumption
Self-care II	Sleep rhythm, sleep hygiene, relaxation techniques
Worries and loneliness	Coping with worries and pandemic stressors, mindfulness, positive reappraisal
Daily routines and behavioral activation strategies	Goal setting, schedule planning, dealing with boredom, behavioral activation, focused work and studies at home, communication in challenging situations, for example, conspiracy theories
Media and health literacy	Basic concepts of epidemiology, statistical indicators (e.g., incidence), verifying the credibility of media messages
Support services	Links to further health-related information sources, contact for emergencies, financial aids

2.6 | Calculation of sample size

G*Power software version 3.1.9.7 was used to calculate the planned sample size (Faul et al., 2007). For this study, an effect size of Cohen's $d=0.3$ was assumed, comparable to previous studies examining resilience interventions (Lehr et al., 2018; Linz et al., 2020). For calculating differences in mental health outcomes in the baseline to postintervention comparison, the statistical power was set at 80% with a significance level of $\alpha = 5\%$. After considering a dropout rate of 60%, as found in other resilience interventions (Linz et al., 2020), the required sample size amounted to $N = 115$.

2.7 | Data management

Data collection for baseline and postassessment was conducted online using the Research Electronic Data Capture assessment platform (REDCap) hosted at TU Dresden. REDCap is a secure, web-based software platform suitable for study data management (Harris et al., 2009, 2019). Data on user behavior and acceptance of the intervention were collected via the Minddistrict e-health platform. User accounts were password protected. Data of participants were pseudonymized and deleted upon study withdrawal.

2.8 | Statistical analyses

Data analysis was conducted using IBM SPSS Statistics 27.0 software and Microsoft Excel 2019 MSO (version 16.0.14026.20202). Reach, use, and acceptance of the intervention was described descriptively. Intervention users are defined as individuals who viewed at least the first page of a module. Baseline–post comparisons of mental health outcomes were calculated using the intention-to-treat (ITT) principle (Armijo-Olivo et al., 2013). IBM SPSS Statistics 27.0 was used to compute a linear mixed model with an expectation-maximization algorithm for missing values (Beunckens et al., 2005) using constrained maximum likelihood estimation. The time points of baseline and postassessment were set as fixed effects, and resilience, perceived stress, and psychological symptom burden were set as dependent variables in separate calculations. Effect sizes of the ITT analyses were calculated by dividing the baseline–post differences of resilience, perceived stress, and psychological symptom burden by the pooled standard deviation, respectively (Cohen, 2013). An additional baseline–postassessment completer analysis and a comparison between intervention users and nonusers was carried out using a dependent-samples t -test to explore possible effects of the intervention. Effects of group (intervention users vs. nonusers) and time on mental health outcomes were computed with a mixed analysis of variance (ANOVA). All statistical tests were previously checked for prerequisites. The confidence interval was set at 95% for all tests. Statistical tests were calculated two-sided.

3 | RESULTS

3.1 | Participants and reach

A total of 1146 individuals started the baseline assessment until January 30, 2021. Of these, 802 eligible individuals received access to the intervention and 273 individuals completed the postassessment, which amounts to a baseline–post dropout of 66%. Figure 1 describes the study flow of participants. The analyzed 798 participants represent 2.0% of the university's population (students and employees combined). Of these, $n = 728$ students represent 2.3% of the student population and $n = 70$ employees represent 0.8% of the employee population.

Participants' mean age was $M = 26.1$ years ($SD = 6.3$, minimum = 19, maximum = 66). A total of 70 employees (9%) and 728 students (91%), 573 women (72%), and 225 men (28%) participated in the study. The majority of participants reported having a high school diploma or equivalent degree (65%) and currently working or studying in the field of mathematics and science (25%). A detailed sample size description is summarized in Table 2. At baseline, students, compared to employees, scored significantly higher on perceived stress ($t(796) = 3.12$, $p = 0.002$) and on psychological symptom burden ($t(796) = 2.17$, $p = 0.030$) but not on resilience (see Supporting Information: Table 1 for descriptive statistics of baseline outcome measures).

3.2 | Intervention use

Of the 798 eligible participants, 550 (69%) accessed the intervention platform at least once, of which 195 (24%) logged on only once. On average, these 550 participants logged on four times ($SD = 4.33$, minimum = 1, maximum = 33). Forty-five percent of logons to access the platform was via a browser, 45% via the mobile app, and 10% of logons was both via a browser and a mobile app.

After logging on, 506 (63%) participants opened at least one intervention module. These participants accessed an average of 1.90 modules ($SD = 1.64$, minimum = 1, maximum = 7), completing on average 66% of the opened modules ($SD = 43\%$, minimum = 0%, maximum = 100%), while 37 (5%) completed all intervention modules. An overview of opened and completed modules can be found in Supporting Information: Figure 1.

3.3 | Acceptance

On average, participants evaluated all modules positively ($M = 3.57$ – 4.28). The module Daily Routines and Behavioral Activation Strategies was rated best ($M = 4.28$, $SD = 0.59$). On average, module length was rated as “just right”, with a tendency toward too long. Supporting Information: Table 2 gives an overview of the module acceptance and length ratings.

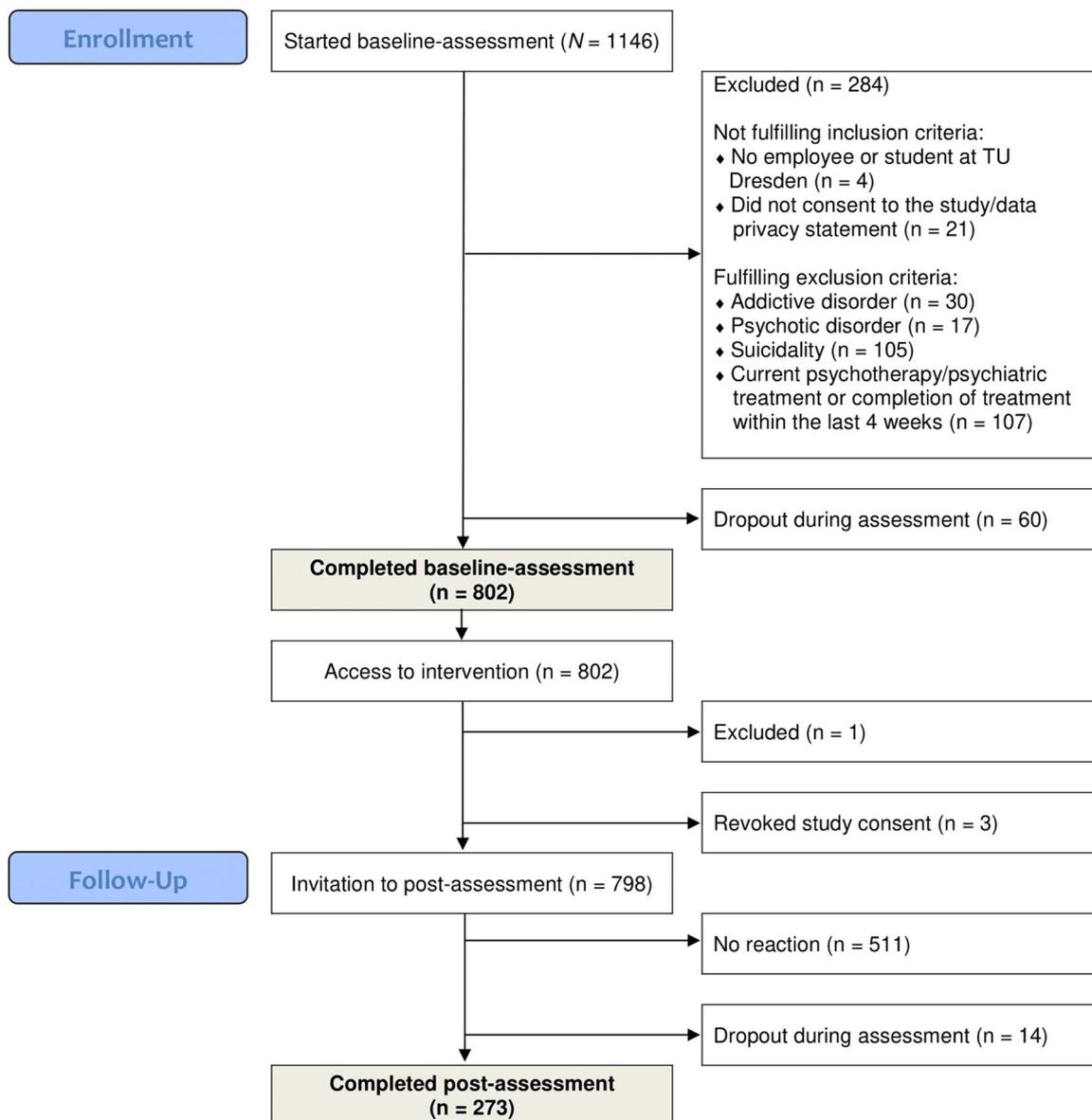


FIGURE 1 Study flow of participants from enrollment to postassessment.

A total of 273 individuals (34%) completed the postassessment. Eighty-seven (32%) completers reported not having used the intervention. Users of the intervention had a good overall impression of the intervention ($M = 3.91$, $SD = 0.66$, minimum = 1, maximum = 5). The majority of completers preferred to choose freely from the offered modules (127 participants, 68%). Fifteen (8%) completers reported having missed content not covered by the intervention.

3.4 | Mental health outcomes

Both ITT and completer analyses revealed significant improvements in resilience, perceived stress, and psychological symptom burden from baseline to postassessment (see Table 3) with small effect sizes in the ITT sample, and small to medium effect sizes in the completer sample.

3.5 | Post hoc and sensitivity analyses

To explore potential changes in mental health outcomes during the use of the intervention, completers were divided post hoc into a group of intervention users and a pseudocontrol group. This exploratory analysis was conducted to compare changes in resilience, perceived stress, and psychological symptom burden between participants who used the intervention at least once ($N = 230$) to those who did not open the intervention at all ($N = 56$). The mixed ANOVA showed a significant main effect of time on resilience ($F(1,284) = 9.67$, $p = 0.002$), perceived stress ($F(1,273) = 24.34$, $p < 0.001$), and psychological symptom burden ($F(1,273) = 5.31$, $p = 0.022$). There were significant interaction effects of time point \times use of intervention for resilience ($F(1,284) = 13.18$, $p < 0.001$), and perceived stress ($F(1,273) = 7.04$, $p = 0.008$), but not for psychological symptom burden ($F(1,273) = 2.62$, $p = 0.11$). There was no

TABLE 2 Baseline characteristics of participants.

Sociodemographic characteristics	Full sample (N = 798)	Students (n = 728)	Employees (n = 70)
Age, M (SD)	26.05 (6.29)	25.09 (4.95)	36.07 (9.38)
Gender, n (%)			
Female	573 (71.8)	526 (72.3)	47 (67.1)
Male	225 (28.2)	202 (27.7)	23 (32.9)
Highest level of education, n (%)			
A-level, 3 or 3.5 years of vocational training, dual vocational training	519 (65.0)	515 (70.7)	4 (5.7)
Bachelor, business specialist, business administrator, foreman	145 (18.2)	143 (19.6)	2 (2.9)
Diploma, master's degree	108 (13.5)	57 (7.8)	51 (72.9)
Doctorate	13 (1.6)	3 (0.4)	10 (14.3)
Other qualifications ^a	13 (1.6)	10 (1.3)	3 (4.3)
Relationship status, n (%)			
In a relationship	357 (44.7)	337 (46.3)	20 (28.6)
Single	314 (39.3)	300 (41.2)	14 (20.0)
Married, civil partnership, relationship with shared household	120 (15.0)	87 (12.0)	33 (47.1)
Divorced with or without a new relationship	7 (0.8)	4 (0.5)	3 (4.3)
Weekly hours of work, n (%)			
1–10 h/week	46 (5.8)	46 (6.3)	0 (0.0)
11–20 h/week	23 (2.9)	15 (2.1)	8 (11.4)
21–30 h/week	22 (2.8)	6 (0.8)	16 (22.9)
31–39 h/week	13 (1.6)	4 (0.5)	9 (12.9)
Full time (40 h/week)	59 (7.4)	22 (3.0)	37 (52.9)
Monthly net income, n (%)			
Less than 500€	266 (33.3)	266 (36.5)	0 (0.0)
500–1000€	357 (44.7)	353 (48.5)	4 (5.7)
1000–2000€	97 (12.2)	74 (10.2)	23 (32.9)
2000–2500€	37 (4.6)	19 (2.6)	18 (25.7)
2500–3000€	21 (2.6)	4 (0.5)	17 (24.3)
More than 3000€	13 (1.6)	6 (0.8)	7 (10.0)

^aOther qualifications combine the categories of vocational training preparation, vocational preparation year, lower secondary school leaving certificate, introductory qualification, vocational school (basic vocational training), intermediate secondary school leaving certificate, 2-year dual vocational training, in training without previous qualification, and other qualifications.

significant main effect of group (intervention use vs. no use) in resilience ($F(1,284) = 0.06$, $p = 0.80$), perceived stress ($F(1,273) = 0.98$, $p = 0.32$), or psychological symptom burden ($F(1,273) = 0.05$, $p = 0.82$) (see Supporting Information: Table 3 for descriptive statistics of both groups, Supporting Information: Figures 2–4 for graphical illustrations).

An additional exploratory analysis showed that intervention users reported significantly reduced perceived stress at postintervention compared to nonintervention users ($t(273) = 2.15$, $p = 0.033$), while there were no significant between-group differences in resilience or psychological symptom burden. Intervention users and nonusers did not differ significantly at baseline in these measures.

4 | DISCUSSION

The aim of the present pilot study was to develop an internet- and mobile-based intervention to foster resilience and maintain mental health during the COVID-19 pandemic in members of a university. We also intended to evaluate changes in resilience, perceived stress, and psychological symptom burden from baseline to postintervention, as well as reach, use, and acceptance of the intervention.

With regard to reach of the intervention, almost 800 individuals completed the baseline assessment during a short time period of less than 2 months, which indicates the high need for a digital

TABLE 3 Descriptive statistics, within-group comparisons, and effect sizes of mental health outcomes from baseline to postintervention based on intention-to-treat and completer samples.

Questionnaire	N	Baseline M (SD)	Post M (SD)	t	df	p	d (95% CI)
Intention-to-treat							
BRS	798	3.04 (0.72)	3.18 (0.41)	-4.69	1261.72	<0.001	0.23 (0.20-0.26)
PSS-10	798	21.14 (5.92)	19.54 (3.6)	6.5	1314.83	<0.001	0.32 (0.07-0.57)
PHQ-4	798	4.83 (2.47)	4.47 (1.36)	3.59	1238.75	<0.001	0.18 (0.09-0.27)
Completers							
BRS	286	3.09 (0.7)	3.3 (0.66)	-6.56	285	<0.001	0.39 (0.31-0.47)
PSS-10	275	20.89 (5.69)	18.07 (5.83)	8.23	274	<0.001	0.50 (-0.19-1.19)
PHQ-4	275	4.69 (2.37)	4.14 (2.27)	4.17	274	<0.001	0.25 (-0.02-0.52)

Abbreviations: BRS, Brief Resilience Scale; CI, confidence interval; d, Cohen's d; PHQ-4, Patient Health Questionnaire-4; PSS-10, Perceived Stress Scale-10.

intervention in times of the pandemic. Ninety-one percent of reached participants were students of TU Dresden. While resilience scores of students and employees were comparable at baseline, students reported higher levels of stress and psychological symptom burden than employees at baseline. This is in line with results by Xiong et al. (2020), which showed that student status, younger age, and unemployment were associated with higher psychological distress during the COVID-19 pandemic. Our intervention might therefore have reached the intended target group, that is, individuals with mental health problems willing to improve their resilience.

About two-thirds of participants opened at least one intervention module, whereas only 5% of participants completed all modules. The intervention was utilized more often in comparison to other studies investigating app-based interventions targeting mental health concerns relating to COVID-19 (Bruhns et al., 2021; Jaworski et al., 2021), but less often than in the study of Lahtinen et al. (2021). In the latter study, participants had to complete 10-min daily meditation exercises for 4 weeks, which may have been less time-consuming and thus more feasible. In bounce, participants on average accessed two of the seven modules; overall access rates of modules ranged between 9% and 63%. As expected, not all topics were equally relevant to participants. Offering optional modules tailored to the individuals' constantly changing needs may therefore be suitable during the pandemic.

Baseline-post dropout (66%) was slightly higher when compared to other digital resilience interventions (Linz et al., 2020). Studies investigating app-based interventions for university members during the COVID-19 pandemic found dropout rates ranging from 9% to 34% (Bruhns et al., 2021; Lahtinen et al., 2021; Sun et al., 2022). As our study examined an unguided self-help intervention, a higher dropout rate was to be expected (Baumel et al., 2019).

Overall, the intervention bounce was well accepted. About one-third of completers reported not having used the intervention. Reported barriers of use were length of the modules, time needed to complete the modules, and content not meeting the

participants' needs and expectations. Adherence to bounce might therefore be improved by designing shorter and (even more) individualized modules. Adherence to the intervention could also be increased by sending reminders (Titov et al., 2013; van Straten et al., 2008), which were not utilized in the current study.

Participants' self-reported resilience increased, while perceived stress and psychological symptom burden decreased from baseline to postassessment. Effect sizes of mental health outcomes were largest in the completer sample and on perceived stress, followed by resilience and psychological symptom burden. A post hoc exploratory analysis revealed that users of the intervention showed improvements in resilience, whereas resilience did not change for nonusers from baseline to postassessment. Both groups showed a decrease in perceived stress over time, with intervention users indicating a greater reduction of stress compared to nonusers. Offering digital interventions to the target group of university members can therefore possibly improve a range of mental health-related symptoms (Harrer et al., 2019; Riboldi et al., 2023).

The digital delivery mode of the intervention bounce offered a crucial advantage during the pandemic by enabling accessible support while overcoming mandatory restrictions and ensuring the safety of individuals.

4.1 | Limitations

For ethical reasons, given the uncontrollable pandemic situation, we decided to choose an uncontrolled study design (Ma et al., 2020). Thus, other time factors, such as the dynamic of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection waves could have affected outcome measures. Also, the existence of other stressors, not related to the pandemic, for example, examination periods at TU Dresden could not be controlled for. The efficacy of the intervention in terms of an improvement in participants' mental health can only be evaluated through a randomized controlled trial,

preferably with a follow-up assessment to examine long-term effects.

Furthermore, excessive media consumption during the pandemic was not covered by the intervention content and was mentioned as missing by some participants. Studies found the higher use of media during the COVID-19 pandemic to be related to greater mental health issues (Bendau et al., 2021; Daimer et al., 2022). Therefore, dealing with media consumption could have been a helpful addition to bounce.

Finally, the generalizability of the results on the general population is limited since only members of TU Dresden were included and participants were primarily women, who are more likely to show help-seeking behavior than men do (Harris et al., 2016; Thompson et al., 2016). Additionally, psychology students received course credit for study participation and completing modules, which may be indicative of a potential self-selection bias. We were also not able to assess potential moderators of the outcomes, such as a previous SARS-CoV-2 infection, risk status, and being in quarantine during the study period.

5 | CONCLUSIONS

The internet- and mobile-based intervention bounce offered well-accepted and easily accessible help during the pandemic winter of 2020/2021. Provided the efficacy of bounce can be confirmed in a randomized controlled trial, the intervention could be a helpful tool for upcoming epidemics or pandemics. Although the pandemic situation has improved in most countries by now, the flexible structure of bounce could be relatively easily adapted and may therefore be useful for future pandemic and nonpandemic adversities.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This trial has been approved by the ethics board of TU Dresden (EK-368082020).

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PEER REVIEW

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SUPPORTING INFORMATION

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

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