Exploring User-Related Drivers of the Early Acceptance of Certified Digital Stress Prevention Programs in Germany

Jennifer Apolinário-Hagen[1] iD, Severin Hennemann[2], Christina Kück[3], Alexandra Wodner[3], Dorota Geibel[3], Marlies Riebschläger[3], Martin Zeißler[3] and Bernhard Breil[4]

[1]Institute of Occupational, Social and Environmental Medicine, Centre for Health and Society, Faculty of Medicine, University Hospital Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany. [2]Department of Clinical Psychology, Psychotherapy and Experimental Psychopathology, Institute of Psychology, University of Mainz, Mainz, Germany. [3]Faculty of Psychology, University of Hagen, Hagen, Germany. [4]Faculty of Health Care, Hochschule Niederrhein, University of Applied Sciences, Krefeld, Germany.

ABSTRACT: Electronic mental health services represent innovative instruments to increase the dissemination of stress programs in primary prevention. However, little is known about facilitators of their uptake. This study aimed to explore determinants of the acceptance of centrally certified digital stress coping programs and preferences for service delivery modes among adult members of German statutory health insurances. Participants completed a multi-construct 45-item questionnaire covering acceptance of digital stress prevention (behavioral use intention) and potential predictors we assessed using hierarchical regression analysis—(1) socio-demographic variables and time spent online, (2) openness to experience, (3) perceived stress, and (4) attitudes toward e-mental health. Preferences in terms of the willingness to use online, face-to-face and blended programs were analyzed using paired t-tests. Participants (N = 171, 66% female, 18-69 years) reported a moderate acceptance of digital stress management (M = 2.76, SD = 1.16, range: 1-5). We identified younger age (ß = -0.16, P = .009), openness to experience (ß = 0.17, P = .003), and positive attitudes (ß = 0.61, P < .001) as predictors of acceptance (R^2 = .50, P < .001). Face-to-face was preferred over online (d = 0.40) and blended (d = 0.33), and blended over stand-alone online delivery mode (d = 0.19; all P < .001). Our findings indicate that promoting favorable attitudes toward digital stress prevention through tailored information may be a starting point to facilitate their adoption.

KEYWORDS: Mental health, eHealth, mHealth, attitude to computers, acceptability of health care, psychological stress, preventive health services, public health

Introduction

Chronically elevated stress levels have been shown to noticeably contribute to the progress of several somatic and mental disorders,[1,2] and increased utilization of primary care.[3] The total estimated costs for work-related stress alone account for up to hundreds of millions of US dollars across Western countries.[4] More remarkably, population-wide costs of psychological distress can be twice as high as for major depressive disorder.[5] Stress coping programs are often provided in occupational settings like workplaces.[6] Studies indicate long-term effectiveness of occupational stress management interventions on stress reactivity and the prevention of mental health problems.[7,8] By contrast, there are individual self-help and group stress management programs, but the utilization of face-to-face psychological programs is often limited due to several barriers, such as limited availability or inconvenient access.[9] Another drawback for the uptake of self-help services is lacking match with individual needs, competences, and interests, which can be addressed by providing users compatible choices.[10] Electronic mental health (e-mental health) services that can be provided via websites, mobile health applications (mHealth apps) or a combination of traditional and digital delivery modes have been suggested for the population-wide dissemination of interventions for the prevention of mental disorders.[11-13]

Digital prevention programs for stress coping

Several studies confirmed the efficacy of online (Internet-based or mobile stand-alone) and blended stress management programs across several populations,[14,15] including employees.[16,17] Blended stress management interventions combine face-to-face guidance with digital self-help components and can either use an integrated or sequential (stepped) approach that may reach more populations than stand-alone programs.[18] Yet, evidence-based eHealth programs are seldom publicly accessible.[19] Also, the implementation of e-mental health into primary care is not advanced.[20] Limited availability is also an issue for blended mental health programs that are currently mainly tested with patient populations.[18] Potentially, organizational efforts for blended formats make them currently unattractive for providers

of individual self-help programs in primary prevention. In contrast, there are countless mental health apps openly available for smartphone users, but most are of dubious quality[21] or fail to meet relevancy criteria for stand-alone stress management interventions.[15] These conditions can make it difficult for citizens to find suitable, high-quality e-mental health services for stress management and prevention purposes.

Several European countries like Germany cover the costs of preventive health services by public financing.[22] In Germany, 85% to 87% of citizens (about 70 million) have statutory health insurance.[23,24] Cost reimbursement or subsidy of individual-based prevention courses (80%-100%) that are approved by the central certification unit for prevention for all members require regular participation, which can be hardly attainable for populations like shift workers. According to an official prevention report, in 2018, the vast majority of utilized individual-based primary prevention courses (by nearly 1.7 million members) targeted physical activity (69%), while only 28% addressed stress coping (with 90% relaxation courses).[25]

To increase the utilization rates and access to primary prevention, the German National Association of Statutory Health Insurance has extended their certification guidelines from traditional face-to-face to digital prevention using information and communication technology (ICT-based self-help), including stand-alone online courses, webinars, and blended formats.[26] Certifiable online or blended multimodal stress coping programs must adhere to several established quality criteria, such as professional guidance, proof of effectiveness, and assurance of data security.[26] A search in the database of the German central certification unit revealed over 30 certified online stress coping programs in early 2020 (c.f., https://www.zentrale-pruefstelle-praevention.de/).

Now that the preconditions for the population-wide dissemination of digital stress prevention programs exist, their efficient adoption by insured persons becomes the next challenge. Compared to interventions with acute effects, preventive innovations usually tend to diffuse relatively slowly based on the delayed reward after adoption.[27] In countries being still early underway to implement e-mental health services into healthcare, such as Germany, Spain, or Switzerland,[28] little is known about individual facilitators of their uptake.

Determinants of the acceptance of digital stress prevention programs

To assess early forms of eHealth acceptance, regardless of user experience, the Unified Theory of Acceptance and Use of Technology (UTAUT[29]) offers an established framework. In the UTAUT, acceptance is operationalized as the behavioral intention to use technology. Intentions have been demonstrated to predict technology use in various application fields,[30] including the use of e-mental health services, at least when the specific health technology, context, and target population are considered.[31] According to the behavior change

model for Internet interventions,[32] user characteristics such as demographic background, health status, personality traits, and attitudes and beliefs can serve as predictors of intervention outcomes or be used for tailoring of program contents to users' needs.

Regarding socio-demographic determinants, a systematic review[33] found that societal status and female gender were associated with the increased use of prevention and health promotion services. Furthermore, more favorable views on e-mental health services were identified among women and for higher education levels.[34-36] Some studies also demonstrated a positive influence of younger age[31,34,36] and time spent online or health-related Internet use[37-39] on the acceptance of e-mental health services.

As an overall evaluative judgment on the attributions of a psychological object (eg, ranging from harmful to helpful), attitudes represent a well-studied antecedent of behavioral intentions and behavior.[40] A positive influence of favorable attitudes on consumers' technology acceptance has been shown across a broad range of innovations,[41] e-mental health treatment services[34,42] and mHealth apps.[43] Since negative attitudes can be more powerful barriers for help-seeking behavior than structural barriers,[31,44] it is important to note that negative views on e-mental health services may be improved by providing consumers with tailored information material.[42,45]

Another individual determinant of the acceptance of eHealth self-help services may be openness to experience,[46] which involves the degree of favoring novelty and active, reflective seeking of varied experience in broad areas of life.[47] While openness was linked to healthcare decision-making,[48] engagement in coping strategies,[49,50] and the acceptance of self-management apps for chronic illness,[46] it remains unclear whether open-minded people are also rather inclined to use e-mental health services. In a recent Finnish study, Ervasti et al[51] found no significant association between openness and interest in using stress management apps among university students. A potential reason may be that students are usually digital natives, for whom apps are nothing new, and therefore this trait played a subsidiary role. On a population level, though, openness to experience may predict who is ready to try digital prevention programs. This assumption is supported by the Diffusion of Innovation (DOI) theory,[52] according to which the minority of innovators and early adopters are characterized as well-informed about the innovation and socioeconomically privileged. To date, early adopters most likely also represent the minority in countries like Germany, given the low public awareness of e-mental health.[37,38,53] Hence, openness may explain individual differences in innovation adoption and help to tailor health messages.

In contrast to relatively stable personality traits, intervention preferences, mental health states and needs can vary and be driven by current stress and coping appraisals. According to the Protection Motivation Theory (PMT[54]), threat appraisals (ie, perceived severity and vulnerability) and coping appraisals on

the recommended behavior change influence individual reactions to messages regarding primary prevention and health promotion. Perceived stress may shift one's attention toward related harms caused by chronic or excessive strain and the need for support. Stress is often assessed as an unspecific indicator of symptom severity and was found to be associated with intentions to use e-mental health services,[31,55] including a higher interest in using mHealth apps for stress management.[51]

From a public health perspective, there is a high potential of using digital prevention of mental disorders, especially regarding otherwise than online hard to reach populations like young adults and people perceiving stigma with a preference for online activities.[56]

Preferences for delivery modes of stress prevention programs

Matching preferences for delivery modes of mental health services with individual needs—instead of a "one size fits it all" approach—could improve the uptake of self-help digital interventions.[34,53] and engagement in blended interventions.[57] In recent years, research pointed to a public preference for face-to-face over e-mental health treatment services.[39,36,58] Regarding health promotion and prevention, studies from Germany so far indicated a low-moderate interest in using e-mental health or mHealth interventions for dealing with psychological stress in patients[31] and the general population.[37] As a proposed combination of the advantages of online and face-to-face modalities, blended interventions are becoming increasingly popular among healthcare professionals.[59] Accordingly, a survey[28] of the E-COMPARED project revealed a greater preference for blended compared to standalone digital treatments for depression among stakeholders of e-mental health implementation in Europe.

To conclude, preferences and determinants of the acceptance of certified digital stress prevention programs among adults remain uncertain. This study aims at addressing this knowledge gap with first insights that are transferable to several countries being underway to establish or implement quality-approved e-mental health in primary prevention.

Objective

The aim of this study was (1) to assess trait- and state-related determinants of the acceptance of certified digital stress management programs (behavioral use intention) and (2) to explore preferences for delivery modes (in terms of the willingness to use online programs in comparison to face-to-face and blended formats) among adult members of statutory health insurance companies in Germany. We assumed statistically significant positive influences of attitudes, openness to experience and perceived stress on the acceptance of digital stress management programs after controlling for the influence of socio-demographic variables and time spent online. In addition, we expected

a preference for face-to-face over online and blended formats for stress coping interventions.

Methods

Study design and data collection

Data for this cross-sectional study with a multi-construct 45-item survey were collected anonymously between May 23, and June 9, 2019, using Unipark software (Enterprise Feedback Suite [EFS], Questback) and paper-and-pencil questionnaires.

The study information involved plain explanations on certified stress management programs following the German prevention guidelines to establish a common understanding. In Germany, statutory health insurance funds are responsible for health promotion and disease prevention, as regulated by the §20 Social Code Book V.[60] These guidelines adhere to internationally established quality criteria for prevention and eHealth programs. A search in the database of the central certification unit for online stress coping programs using the websites of the two largest health insurances ("Techniker Krankenkasse," and "Barmer," finally on January 23, 2020) revealed over 30 certified stand-alone interventions (k = 35, k = 34, respectively) but no blended formats. About 20 stand-alone online courses focused on multimodal stress management and mindfulness, while the remaining involved hatha yoga and relaxation programs. Although statutory health insurance has to ensure universal coverage with a broad range of benefits, citizens have a free choice between more than 100 competing statutory funds.[61] Thus, different health insurances provide a search mask for centrally certified courses on their websites. Besides this, health insurances offer digital programs exclusively for members, and therefore the number of hits can vary.

In our study, we introduced and consistently used the umbrella term "online stress coping program" for Web- and App-delivered formats for pragmatic reasons. The average completion time was 15 minutes. This study was approved by the research ethics committee of the Faculty of Psychology at the University of Hagen, Germany (Ref. No. EA_85_2019).

Participants and recruitment

Using convenience sampling, self-selected members of German statutory health insurances over the age of 18 years who gave informed consent (either written or online) were recruited via posts on social media websites like Facebook and personal contacts. A priori power analysis using G*Power,[62] version 3.1.92, for multiple linear regression (R^2 increase, max. 7 predictors) was conducted under the assumption of detecting at least moderate effect ($f^2 = 0.15$, power = .95, alpha = .05), which we decided based on similar research.[31] The calculated minimum sample size was N = 153. An information sheet on how to find available certified stress management programs was offered as compensation for participation.

Measures

Primary outcome: determinants of acceptance of digital stress management programs. Based on the German adaption of the UTAUT measure[29] to Web-based aftercare by Hennemann et al,[31,38] we assessed the acceptance of digital stress coping programs with the 3-item scale "behavioral use intentions" on a 5-point Likert-type scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). We only replaced the term "aftercare"[31] with "stress coping program": (1) "I would like to try an online stress coping program," (2) "I would use an online stress coping program," and (3) "An online stress coping program would be worth paying for." Cronbach's alpha was good in our study ($\alpha = .87$) according to Cohen's criteria,[63] and comparable to reliability scores reported by Hennemann et al.[38]

To assess cognitive attitudes, we adapted the 17-item E-Therapy Attitudes Measure (ETAM)[53] from online therapies to stress coping programs under the supervision of the test author (Supplementary material, Table S1). After reading information on face-to-face and online stress management programs, participants were instructed to indicate their agreement with each statement on a 5-point rating scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Cronbach's alpha was excellent in our study ($\alpha = .90$), like in prior work using the original measure.[53]

We used the Big-Five Test (B5T) by Satow[64] to assess openness to experience with 10 heterogeneous items on a 4-point rating scale ranging from 1 ("fully disagree") to 4 ("fully agree"). Cronbach's alpha in our study was acceptable ($\alpha = .73$) for a personality measure and equivalent to the score reported in the B5T-manual.[64]

Furthermore, we used the German 10-item version of the Perceived Stress Scale by Klein et al,[65] (PSS-10) to assess the overall frequency of stress perceptions in the past 2 weeks on a 5 point-Likert-type scale ranging from 1 ("never") to 5 ("very often"). The survey software we used does not include the number zero in scales so that we transferred the scale to the original response format of 0 to 4 for descriptive analysis (total score). Cronbach's alpha was good in our study ($\alpha = .86$), and comparable to the validation study[65] ($\alpha = .84$).

As categorical control variables (see, Table 1), we assessed gender (3 options, dummy coded), age group (7 options, dummy coded), highest educational attainment (9 options), and time spent online (5 options).

Secondary outcome: preferences for delivery modes. We operationalized the strength of preference for delivery modes as the willingness to use face-to-face, online and blended formats of stress coping programs using a 4-point response scale ranging from 1 ("strong agreement") to 4 ("strong disagreement") to avoid a central tendency. Based on prior research,[66,67] we constructed three items: "In case of a high perceived stress load together with the need for support for health-related purposes, I would utilize . . ." (1) ". . . online stress coping programs

(e-mental health services).," (2) ". . . on-site online stress coping courses." (ie, face-to-face), or (3) ". . . blended learning stress coping courses (a combination of online units with face-to-face components)."

Statistical analysis

Study dropouts were completely excluded. Participants meeting exclusion criteria were automatically screened out by the survey software. All other data sets of participants with informed consent and valid data were considered for data analysis. Statistical tests for significance (alpha level of .05) were performed using IBM SPSS, version 25.0 (IBM Analytics). As a convention for classifying effect sizes and Cronbach's alpha reliability, we refer to Cohen's criteria.[63]

Pairwise deletion (available case approach within completed data sets) was conducted in the event of less than 5% of data sets having at least one missing value per scale, instead of multiple imputations. We classified mean and total scores (Table 2) based on face validity for the non-diagnostic scales, including the PSS-10[65] (range: 0-40; total score in the German validation study: $M = 12.57$, $SD = 6.42$), for which cut-off scores exist,[65] the ETAM[53] (range: 1-5; mean score, low = 1-2.49, moderate = 2.5-3.49, and high = 3.5-5), and the UTAUT subscale on acceptance[31] (behavioral use intention; low = 1-2.34, moderate = 2.35-3.67, and high = 3.68-5[31]). We evaluated openness as an average based on the B5T manual (ie, $M = 29.75$, $SD = 4.63$, range: 11-40).[64]

Before analysis, we checked the data for violations of assumptions for parametric tests. The selection and successive order of predictors of acceptance for the hierarchical regression analysis (inclusion method for entering variables per block) were based on theoretical considerations,[32,40,68] empirical research,[38,53,66] and significant zero-order correlation analyses: (1) socio-demographic variables and time spent online (control variables), (2) openness to experience (trait), (3) stress perceptions (health state), and (4) attitudes toward digital stress coping programs (e-mental health-specific judgment). Beta-weights and increases in variance explained (R^2 change) in acceptance were inspected per step, after having accounted for the incremental influence of other predictors.

Preferences for service delivery modes (online, face-to-face, and blended) were analyzed using paired t-tests at a significance level of .05 (in case of variance homogeneity).

Results

Descriptive and preliminary analyses

Participants. The final sample consisted of N = 171 participants (Table 1). Out of initially 181 data sets (n = 139 online, n = 42 paper-and-pencil), we excluded n = 10 due to withdrawal of consent (n = 2), statement of no serious participation (n = 1), and at least one missing value on per scale for computing scores (n = 7). Screening for outliers, based on DfBeta, and DfFIT/

Table 1. Sample characteristics (N = 171).

CHARACTERISTIC	NO. (%)
Gender[a]	
Female	113 (66.1)
Male	57 (33.3)
Other	1 (0.6)
Age group[b]	
18-19	2 (1.2)
20-29	33 (19.3)
30-39	65 (38.0)
40-49	35 (20.5)
50-59	27 (15.8)
60-69	9 (5.3)
70 or older	0 (0)
Education level attained[c]	
No school certificate	0 (0)
Basic or secondary school	14 (8.2)
Higher school education	25 (14.8)
Apprenticeship (vocational training)	38 (22.2)
Mastercraftsman qualification	2 (1.2)
University or college degree (Bachelor level)	37 (21.6)
University or college degree (Master level)	43 (25.1)
Postgraduate or postdoctoral degree	7 (4.1)
Other qualification	5 (2.9)
Time spent online	
More than 6 hours per day (daily)	24 (14.0)
Between 3 and 6 hours per day (daily)	72 (42.1)
Less than 3 hours per day (daily)	62 (36.3)
Several times per week	11 (6.4)
Less than several times per week	2 (1.2)

[a]Gender was dummy coded for further analysis (0 = female, 1 = male).
[b]Age group (0 = 18-39 years, 1 = 40 years or older) was dummy coded for further analyses.
[c]Education level refers to the German education system.

DfFITS (<1), and Cook's distance (.000-.114), resulted in no further exclusions.

Preliminary analysis. Based on significant correlations with acceptance, we included the five predictors age group (dummy-coded, Spearman's rho = -.23, P = .002) and time spent online (rho = -.25, P = .001) in block 1/step 1 (control variables), openness to experience (r = .21, P = .007) in step 2, perceived stress (r = .20, P = .008) in step 3, and attitudes toward digital stress coping programs (r = .67, P < .001) in the last step 4 in the hierarchical regression model. Gender (dummy-coded, rho = -.06, P = .448) and education level (rho = .01, P = .858) were excluded from further analysis.

Table 2 shows descriptive data and bivariate Pearson's correlations between the mean scores of metric variables. All considered scores were classified as having a modest magnitude, except for the moderately high scores of the PSS. Further significant correlations between metric and categorical predictors of acceptance were found for attitudes with online time (rho = .23, P = .002), for openness with education level (rho = .37, P < .001) and for perceived stress with both education level (rho = -.17, P = .025) and gender (rho = -.16, P = .036).

Main results

Determinants of the acceptance of digital stress management programs. Hierarchical regression analysis (Table 3) showed that the included variables explained 50% of the variance in acceptance, R^2 = .50, adjusted R^2 = .49, $F_{(1, 165)}$ = 107.00, P < .001. Both control variables explained 8% of the variance in step 1 (R^2 = .08, P = .001, f^2 = .09). Openness to experience lead to an incremental increase of explained variance of 4% in step 2 (ΔR^2 = .04, P = .006, f^2 = .04), perceived stress contributed further 6% incremental increase in step 3 (ΔR^2 = .06, P = .001, f^2 = .06; steps 1-3 each with small effect sizes), and finally, attitudes added further 32% of explained variance in step 4 (ΔR^2 = .32, P < .001, large effect size of f^2 = .47).

As shown in Table 3, in the final model (step 4), age under 40 years (β = -0.16, P = .009), higher openness to experience (β = 0.17, P = .003), and positive attitudes (β = 0.61, P < .001) showed a significant incremental predictive performance in the acceptance of digital stress coping programs. Time spent online became insignificant after adding openness in step 2 and remained so in step 4 (β = -0.02, P = .739). Perceived stress lost its significant predictive performance after accounting for the influence of attitudes in step 4 (β = 0.11 P = .068; vs β = 0.24 in step 3, P = .001).

Preference for delivery modes. Participants rather agreed (min = 1, max = 4) with the statement that they would use preventive face-to-face stress coping programs (M = 2.96, SD = 0.76), and were less supportive toward using blended (M = 2.70, SD = 0.83) and online (M = 2.54, SD = 0.83) programs.

Paired t-tests showed that face-to-face was significantly preferred over online, $t_{(170)}$ = 5.23, P < .001; Mean$_{diff}$ = 0.43, SD = 1.07, SE = 0.08, 95% confidence interval (CI) [0.27, 0.59]; Cohen's d = 0.40, and blended delivery mode, $t_{(170)}$ = 4.06, P < .001; Mean$_{diff}$ = 0.27, SD = 0.87, SE = 0.07, 95% CI [0.14, 0.40]; Cohen's d = 0.33, both with small effect sizes. In direct contrast, blended was also preferred over online delivery, $t_{(170)}$ = 2.47, P = .014; Mean$_{diff}$ = 0.16, SD = 0.84, SE = 0.06, 95% CI [0.03, 0.28], Cohen's d = 0.19.

Table 2. Descriptive data and correlation analysis between mean values of metric variables for the assessment of determinants of acceptance of certified digital stress coping programs (N = 171).

VARIABLE	DESCRIPTIVE DATA		CORRELATION R[a]		
	MEAN (SD)	TOTAL[b] (SD), RANGE	1	2	3
Acceptance (UTUAT)[c]	2.76 (1.16)	8.28 (3.47), 3-15	.21[a]	.20[a]	.67[a]
Predictors					
1. Openness to experience (B5T)[d]	2.80 (0.42)	27.98 (4.23) 16-37	–	−.14	.09
2. Perceived Stress (PSS-10)[e]	2.29 (0.60)	22.94 (6.01) 5-35		–	.20[c]
3. Attitudes (ETAM)	2.98 (0.75)	50.64 (12.76) 17-77			–

Abbreviations: B5T, Big-Five Test; ETAM, E-therapy attitudes measure; PSS, Perceived Stress Scale.
[a]Significant, $P < .05$.
[b]Total score (sum score).
[c]Dependent variable (scale: behavioral use intention); UTUAT = Unified Theory of Acceptance and Use of Technology.
[d]B5T = Big-5-Test (subscale).
[e]PSS-10 = Perceived Stress Scale, 10 items, transferred from a scale ranging from 1-5 to the original scale ranging from 0-4 for descriptive analyses only (scores for the scale we used all analyses was 1-5; mean score: M = 2.71, SD = 0.60; total score: M = 27.06, SD = 6.01; range: 15-45).

Regarding the determinants of acceptance, positive attitudes were significantly associated with a preference for online (r = .68, $P < .001$) and blended (r = .33, $P < .001$), but not with face-to-face delivery mode (r = -.12, $P = .120$). Online preference was associated with higher perceived stress (r = .22, $P = .004$) and blended preference with younger age (r = -.16, $P = .032$). No further significant associations were identified (all $P > .05$).

Discussion

As one of the first of its kind, this study explored determinants the individual acceptance of certified digital stress management programs and preferences for service delivery modes among statutory insured adults in Germany.

Main findings

Consistent with international research[39,69] as well as earlier studies from Germany with inpatients[31,70] and employees,[38] our main findings point to a low-to-moderate acceptance of e-mental health programs for preventing or managing psychological stress. An explanation might be that the public acceptance of e-mental health services depends on the stage of their dissemination in everyday life, which can differ in terms of familiarity with such programs, public knowledge, eHealth literacy or subjective norms.[32] Although the digitalization in German healthcare, like in many other countries, has recently begun to speed up through health policy (eg, "Digital Health Care Act"[71]), it should be noted that the process of diffusion of innovation requires a prolonged period.[27] As one strategy to expedite this process for preventive innovations, Rogers[27] suggested, for example, to alter perceived attributes of the innovation (eg, by pointing out its advantages) through information campaigns. Hence, it appears necessary to educate the public and health professionals about digital preventive mental health interventions through multiple channels of impactful stakeholders like health insurance companies, reputable associations, healthcare providers, workplaces, and universities.[11]

Determinants of the acceptance of digital stress management programs. As expected, attitudes were confirmed as the strongest predictor of acceptance of digital stress prevention interventions, which has been previously mainly investigated for e-mental health treatments.[42,67] Besides this, the positive influence of attitudes on the acceptance of e-mental health for stress coping is consistent with prior work showing a similar strong association of attitudes and the UTAUT-predictor performance expectancy.[55] This finding also corresponds to the construct of response efficacy the PMT[54] (in our case, the expected effectiveness of online stress coping programs), which is a component of the coping appraisal process (eg, considering to engage with these kinds of programs). Positive attitudes regarding the usefulness of digital prevention programs may represent the starting point for efforts that aim to promote their adoption. Accordingly, acceptance-facilitating interventions on e-mental health services[44,45] could be used to educate about the sustainable, long-term benefits of health promotion and prevention. Tailored e-mental health education in continuing training could also help to address the common skepticism among mental health professionals in Germany.[72]

However, interest must not automatically correspond to real-world uptake. While universal primary prevention tries to reach many people before the onset of health problems, it is debatable whether not chronically stressed people are motivated to invest time or money for multi-session stress coping programs. It should be also kept in mind that e-mental health services could be unattractive (not only due to unfamiliarity with use), but also because they might fail to meet the needs, expectations, and preferences of relevant target groups for primary prevention (eg, young adults).[36] Therefore, it is crucial to understand state- and trait-related determinants of acceptance. Based on this knowledge, providers could select specific target

Table 3. Results of the hierarchical regression analysis on determinants of the acceptance of digital stress coping programs (N = 171).

STEPS AND PREDICTORS	b[a]	SE (b)	β[b]	P[c]
Step 1 (background/control variables) (Constant)	10.43	0.77		
Age group[d]	−1.26	0.55	−0.18[c]	.025
Time spent online	0.68	0.32	0.17[c]	.036
R² (control variables) = .08 (P = .001)				
Step 2 (+ *trait/openness to experience*) (Constant)	5.50	1.91		
Age group[d]	−1.41	0.55	−0.20[c]	.011
Time spent online	0.57	0.39	0.14	.078
Openness to experience	0.17	0.06	0.21[c]	.006
ΔR² (+ openness) = .04 (P = .006)				
Step 3 (+ *state/perceived stress*) (Constant)	0.99	2.28		
Age group[d]	−1.49	0.53	−0.21[c]	.005
Time spent online	0.58	0.31	0.14	.065
Openness to experience	0.20	0.06	0.24[c]	.001
Perceived stress	0.14	0.04	0.24[c]	.001
ΔR² (+ stress) = .06 (P = .001)				
Step 4 (+ attitudes)[e] (Constant)	−5.01	1.87		
Age group[d]	−1.10	0.42	−0.16[c]	.009
Time spent online	0.08	0.25	0.02	.739
Openness to experience	0.14	0.05	0.17[c]	.003
Perceived stress	0.06	0.03	0.11	.068
Attitudes toward e-mental health	0.17	0.02	0.61[c]	<.001
ΔR² (+ attitudes) = .32 (P < .001)				
Total R² (full model) = .50 (P < .001)				

[a]b = unstandardized regression coefficient.
[b]β = standardized beta-weight.
[c]Significant, P < .05.
[d]Dummy-coding for age category was performed for age between 18 and 39 years (value = 0) and age 40 years or older (value = 1).
[e]Attitudes toward digital stress coping programs in terms of an e-mental health-specific judgment.

groups to tailor interventions and for the co-design of persuasive preventive programs.[11]

Personality traits may represent another factor to consider who is most likely to use and benefit from digital prevention. Specifically, our results suggest that openness to experience may be another determinant of acceptance, at least at this early stage of e-mental health adoption. Further research needs to replicate this finding in representative samples of adult populations since empirical support on the influence of openness on e-mental health acceptance is still limited and partly inconsistent. For example, in an Australian community sample, Klein and Cook[66] identified higher openness to experience among people preferring face-to-face mental health services compared to the minority of those who preferred e-mental health services several years ago. In our study, we found a preference for face-to-face programs over online delivery formats and statistically significant influence of openness on e-mental health acceptance. In contrast, Ervasti et al[51] showed no significant association between the interest of students in using stress management apps and openness to experience, but with agreeableness and neuroticism.

Especially neuroticism—as a general risk factor for mental health[49]—may be a further determinant across different stages of the process of e-mental health adoption, and potentially be a more stable predictor of health needs than current stress levels.

Although we found a significant positive correlation with the acceptance of digital stress coping programs, perceived stress failed to remain a statistically meaningful predictor after entering attitudes in the hierarchical regression model, which is in contrast to an earlier conducted study where a small but significant influence of stress remained.[55] Nonetheless, this finding to some extent following the afore-mentioned study by Ervasti et al[51] that also showed a positive association between stress and the acceptance of stress management apps, which became non-significant in their regression analysis. One explanation might be that perceived stress is a moderator variable in the relationship between attitudes and behavioral intentions. Another possibility might be that attitudes mediate the association between stress and intentions, which should be tested with a larger, more diverse sample of adult populations. Another explanation for the weak statistical influence of perceived stress might be that "feeling healthy" is a well-known motivational barrier to consider participation in health promotion programs.[73,74] It is possible that the participants in our study were not aware of their stress levels since received no individualized feedback. The overall moderate to mildly severe stress level in our study, according to classifications of the PSS-10 total score (convergent validity with another measure) by Andreou et al,[75] can be viewed as a surrogate for unspecific symptoms or serve as a syndrome-like predictor of mental health problems before onset. Higher stress in the PSS-10 was found to be associated with mental health problems like depression in representative public samples.[65] A practical implication could be to provide screening tools for stress and mental health problems to increase intentions to use psychological interventions, as done in other studies.[11]

This low-to-moderate interest in engaging with stress prevention appears interesting as a motivational issue since it is likely that the negative consequences of chronic and excessive stress are meanwhile well known in the public. For instance, a systematic review[76] concluded that causal beliefs about the depression of lay people often involve stress as an important factor that is related to treatment preferences in Western countries. However, it may be that other appraisals, especially regarding the perceived risks and efficacy of preventive behavior, are less salient among young and healthy people compared to patient populations. This is reflected by the highest uptake of primary prevention by people between 50 and 69 years in Germany (46%).[25] Guo et al[77] showed that threat and coping appraisals could influence mHealth acceptance through the influence of attitude among Chinese employees. Given the proposed relevant role of such health-related appraisals, it might be particularly relevant for health insurances to invest more efforts in target-specific tailored information campaigns and incentives for participation in digital preventive programs.

Among the demographic variables, we could only confirm being under 40 years of age as a predictor of acceptance of e-mental health, while no predictive influence of education, gender, or time spent online was observed, which could be due to our sampling method, considering that panel surveys with employees found such differences.[38] Also, a representative survey of the German population[37] found a higher willingness to use the Internet for mental health purposes among frequent Internet users compared to sporadic users. Overall, our results have to be interpreted against the self-selection of participants, given the fact that half of the sample had a university degree, two-thirds were female and most (92%) were daily Internet users. These groups appear already easier to reach for digital self-help than others do, but they appear to hesitate to utilize digital services.[36,39] Hence, these target groups, and especially digital natives who are not the main groups utilizing primary prevention (7% of all participants were in the age group 20-29 in Germany, 81% were women)[25], could be the first choice groups for co-design studies and efforts to optimize digital prevention strategies. Future efforts should nonetheless also aim to address the black box of harder-to-reach target groups to complete the picture on what choices may be best for whom on a population level. The ultimate goal should be to support citizens in choosing what best suits individual needs and preferences for preventive programs.

Preferences for delivery modes. As expected, we identified a preference for face-to-face over online and blended programs for stress management purposes. In line with this finding, Titzler et al[78] identified technical issues as barriers to the implementation of blended treatments compared to face-to-face programs. Furthermore, our study showed that blended was preferred over online delivery, which is consistent with the views of health professionals from clinical contexts.[79] Participants may have viewed blended programs as some kind of compromise between face-to-face and online programs. Qualitative methods could help explain why blended was preferred over online delivery.

However, given the likely lack of experience with digital prevention programs, participants might have heuristically judged face-to-face mental health services as a kind of "benchmark" and online delivery generally as a decline in quality.[69] This corresponds to the low preference for eHealth for consultation or treatment purposes in Germany.[80]

Also, it should be noted that effect sizes for mean differences in services preferences were small ($d = 0.33$ to $d = 0.40$). We assumed that the information on the provision of guidance is generally considered by users as a benefit of certified digital prevention programs since prior studies showed a greater acceptance[53,66,67] and effectiveness[81] of guided vs self-guided e-mental health treatments. It could be also possible that professional guidance may play a less relevant role in engaging with self-help programs in primary prevention targeting healthy adults than for therapies. Potentially, self-help programs guided by mental healthcare professionals could be

believed to weaken autonomy in terms of being too prescriptive.[10] Accordingly, March et al[39] showed that younger participants from an Australian community sample expressed comparably negative views on therapist-guided online and face-to-face mental health services, potentially due to a high desire for self-reliance in this target group. In another study, Batterham and Calear[36] concluded that reluctance for seeking support face-to-face can be also associated with an unwillingness to use e-mental health services. Thom et al[82] argued that stable prevalence rates of mental disorders and insufficient utilization rates—despite notable improvements in the provision of mental healthcare service over the past two decades in Germany—indicate the ineffectiveness of prevention in its current form.[82] Furthermore, there is a remarkable delay between the onset of a mental disorder and subsequent utilization of healthcare services (eg, an estimated 7 years for any mood disorder in Germany).[83] Potentially, e-mental health services can help to reduce this gap in target groups with positive attitudes toward digital self-help.

Limitations

Despite different strengths of our study, such as its novelty, several limitations should be considered when interpreting the results. First of all, the specific scope of our study on self-help in primary prevention and the sampling method might limit generalizability as well as comparisons with prior work on the acceptance of online or blended treatments for mental disorders, such as depression.[18,84] Also, due to the lack of validated attitude questionnaires for digital prevention we adapted an existing measure on attitude toward online therapies,[53] for which we found an excellent internal consistency like in studies using the original measure.[42,53] Furthermore, our study was conducted in Germany, but this does not restrict comparisons with other countries or health systems, especially those also offering public funding of primary prevention.[22] Moreover, it is interesting to note that the utilization rates of mental health services in Germany are not higher than in other countries.[83] Within the control variables, we assessed age in groups due to data privacy concerns as paper-and-pencil surveys were collected within the personal environment of some authors. Also, the sample was small in size and subject to self-selection bias (mainly female, young and well-educated daily Internet users), which may have resulted in more positive views on digital self-help compared to the general population.[53] However, we were explicitly interested in early attitudes and expectations in terms of a snapshot of the acceptance of digital stress prevention in individuals already using the Internet frequently. For further research, another option could be to use the channels of health insurance companies as well as monetary incentives like gift cards to increase the response rate.

Furthermore, e-mental health programs are seldom known among German citizens.[53] Given the current efforts to promote consensus of quality criteria for eHealth worldwide and the novelty of certified online self-help prevention programs, it is likely that most of the participants were not familiar with these kinds of programs that are available on a large-scale since 2018, as informal feedback from participants indicated. Moreover, we found no available blended programs for primary prevention in early 2020, nearly 2 years since the introduction of central certification. Eventually, blended courses are currently rather provided within settings like workplaces and thus not listed in the central database of the certification unit. Unfortunately, we found no information on utilization rates differentiated for traditional vs online or blended formats in the prevention report 2019.[25] In other countries, to our knowledge, blended formats are proposed for disease management or therapeutic purposes, and are yet like no wide-spread standard part of healthcare or primary prevention.[59,79,85]

Also, in line with prior studies,[42,53] we identified overall neutral or "undecided" attitudes toward e-mental health services. Vague judgments could indicate lacking knowledge about digital prevention programs, which was expectable as we were interested in an early form of acceptance. Although we provided detailed information to address this issue, we must admit that additional visual demonstrations of certified programs using videos could have been helpful for decision-making.[45]

As a final point to consider, the explained variance of 50% in acceptance was mainly attributed to attitudes. Unexplained variance suggests unconsidered determinants, such as knowledge about e-mental health, beliefs about the effectiveness of prevention measures in general and perceived health threat. Also, we did not assess further socio-demographic characteristics like marital and employment status that are associated with life-time rates of utilization of healthcare for mental health purposes.[83] Taken together, our findings need to be interpreted with caution.

Conclusion

Our findings provide first insights on individual determinants of the acceptance of digital prevention before the large-scale implementation into healthcare and implications for cross-national research at a population level. As strategies to speed up the dissemination of certified digital stress coping programs, our study points to the need for a comprehensive public health information strategy that should include consumer-oriented education. This could help to promote curiosity for technological possibilities in various age groups, especially among digital natives, and favorable attitudes as the potential key determinant for the early acceptance of e-mental health programs for stress prevention. Although our findings provide first insights into potential determinants of acceptance, future efforts are required to replicate them in representative samples over different stages of innovation diffusion in primary prevention and health promotion.

Author Contributions

JAH conceived the study idea and study design, led the concept development, data collection, and statistical analysis, sought

ethical approval, was responsible for the interpretation of data, wrote the first draft of the manuscript, and coordinated and finalized the revised article. BB and SH contributed to the study idea and concept, interpretation of data, writing the first draft, critically reviewing and revising the manuscript. CK, AW, DG, MR and MZ contributed to the study design, concept and planning, programmed the online questionnaire, recruited participants for the online and paper-based survey and collected, analyzed and interpreted data under supervision of JAH. All authors reviewed the manuscript, provided feedback and approved the final version of the article.

ORCID iD

Jennifer Apolinário-Hagen iD https://orcid.org/0000-0001 -5755-9225

Supplemental material

Supplemental material for this article is available online.

REFERENCES

1. Yaribeygi H, Panahi Y, Sahraei H, Johnston TP, Sahebkar A. The impact of stress on body function: a review. *EXCLI J*. 2017;16:1057-1072. doi:10.17179/ excli2017-480.
2. McEwen BS. Central effects of stress hormones in health and disease: understanding the protective and damaging effects of stress and stress mediators. *Eur J Pharmacol*. 2008;583:174-185. doi:10.1016/j.ejphar.2007.11.071.
3. Prior A, Vestergaard M, Larsen KK, Fenger-Gron M. Association between perceived stress, multimorbidity and primary care health services: a Danish population-based cohort study. *BMJ Open*. 2018;8:e018323. doi:10.1136/bmjopen-2017-018323.
4. Hassard J, Teoh KRH, Visockaite G, Dewe P, Cox T. The cost of work-related stress to society: a systematic review. *J Occup Health Psychol*. 2018;23:1-17. doi:10.1037/ocp0000069.
5. Chiu M, Lebenbaum M, Cheng J, de Oliveira C, Kurdyak P. The direct healthcare costs associated with psychological distress and major depression: a population-based cohort study in Ontario, Canada. *PLoS ONE*. 2017;12:e0184268. doi:10.1371/journal.pone.0184268.
6. Richardson KM, Rothstein HR. Effects of occupational stress management intervention programs: a meta-analysis. *J Occup Health Psychol*. 2008;13:69-93. doi:10.1037/1076-8998.13.1.69.
7. Li J, Riedel N, Barrech A, et al. Long-term effectiveness of a stress management intervention at work: a 9-year follow-up study based on a randomized wait-list controlled trial in male managers. *Biomed Res Int*. 2017;2017:2853813. doi:10.1155/2017/2853813.
8. Herr RM, Barrech A, Riedel N, Gundel H, Angerer P, Li J. Long-term effectiveness of stress management at work: effects of the changes in perceived stress reactivity on mental health and sleep problems seven years later. *Int J Environ Res Public Health*. 2018;15:255. doi:10.3390/ijerph15020255.
9. Musiat P, Tarrier N. Collateral outcomes in e-mental health: a systematic review of the evidence for added benefits of computerized cognitive behavior therapy interventions for mental health. *Psychol Med*. 2014;44:3137-3150. doi:10.1017/ S0033291714000245.
10. Lucock M, Gillard S, Adams K, Simons L, White R, Edwards C. Self-care in mental health services: a narrative review. *Health Soc Care Community*. 2011;19:602-616. doi:10.1111/j.1365-2524.2011.01014.x.
11. Ebert DD, Cuijpers P, Munoz RF, Baumeister H. Prevention of mental health disorders using internet- and mobile-based interventions: a narrative review and recommendations for future research. *Front Psychiatry*. 2017;8:116. doi:10.3389/ fpsyt.2017.00116.
12. Sander L, Rausch L, Baumeister H. Effectiveness of internet-based interventions for the prevention of mental disorders: a systematic review and meta-analysis. *JMIR Ment Health*. 2016;3:e38. doi:10.2196/mental.6061.
13. Deady M, Choi I, Calvo RA, Glozier N, Christensen H, Harvey SB. eHealth interventions for the prevention of depression and anxiety in the general population: a systematic review and meta-analysis. *BMC Psychiatry*. 2017;17:310. doi:10.1186/s12888-017-1473-1.
14. Heber E, Ebert DD, Lehr D, et al. The benefit of web- and computer-based interventions for stress: a systematic review and meta-analysis. *J Med Internet Res*. 2017;19:e32. doi:10.2196/jmir.5774.

15. Blázquez Martín D, De La Torre I, Garcia-Zapirain B, Lopez-Coronado M, Rodrigues J. Managing and controlling stress using mHealth: systematic search in app stores. *JMIR mHealth uHealth*. 2018;6:e111. doi:10.2196/mhealth.8866.
16. Ebert DD, Lehr D, Heber E, Riper H, Cuijpers P, Berking M. Internet- and mobile-based stress management for employees with adherence-focused guidance: efficacy and mechanism of change. *Scand J Work Environ Health*. 2016;42:382-394. doi:10.5271/sjweh.3573.
17. Magtibay DL, Chesak SS, Coughlin K, Sood A. Decreasing stress and burnout in nurses: efficacy of blended learning with stress management and resilience training program. *J Nurs Adm*. 2017;47:391-395. doi:10.1097/NNA.0000000000000501.
18. Erbe D, Eichert H-C, Riper H, Ebert DD. Blending face-to-face and internet-based interventions for the treatment of mental disorders in adults: systematic review. *J Med Internet Res*. 2017;19:e306. doi:10.2196/jmir.6588.
19. Rogers MA, Lemmen K, Kramer R, Mann J, Chopra V. Internet-delivered health interventions that work: systematic review of meta-analyses and evaluation of website availability. *J Med Internet Res*. 2017;19:e90. doi:10.2196/jmir.7111.
20. Wozney L, Newton AS, Gehring ND, et al. Implementation of eMental health care: viewpoints from key informants from organizations and agencies with eHealth mandates. *BMC Med Inform Decis Mak*. 2017;17:78. doi:10.1186/ s12911-017-0474-9.
21. Torous J, Andersson G, Bertagnoli A, et al. Towards a consensus around standards for smartphone apps and digital mental health. *World Psychiatry*. 2019;18:97-98. doi:10.1002/wps.20592.
22. Van Der Wees PJ, Wammes JJG, Westert GP, Jeurissen PPT. The relationship between the scope of essential health benefits and statutory financing: an international comparison across eight European countries. *Int J Health Policy Manag*. 2016;5:13-22. doi:10.15171/ijhpm.2015.166.
23. Institute for Quality and Efficiency in Health Care. *Health Care in Germany: The German Health Care System*. Cologne: Institute for Quality and Efficiency in Health Care (IQWiG). InformedHealth.org. Published May 6, 2015. Accessed February 8, 2018.
24. Busse R, Blümel M. Germany: health system review. *Health Syst Transit*. 2014;16:1-296, xxi.
25. National Association of Statutory Health Insurance (GKV-Spitzenverband). Präventionsbericht 2019 [Prevention report 2019], report year 2018. https:// www.mds-ev.de/uploads/media/downloads/Praeventionsbericht_2019_barri- erefrei.pdf. Update 2019. Accessed January 27, 2020.
26. Central Audit Body Prevention, Germany. Information für Anbieterinnen und Anbieter von IKT-basierten Selbstlernprogrammen nach § 20 SGB V [Information for providers of ICT-based self-learn programs according to § 20 SGB V]. https://www.zentrale-pruefstelle-praevention.de/admin/download. php?dl=pruefung_online_angebote. Updated June 2019. Accessed June 26, 2019.
27. Rogers EM. Diffusion of preventive innovations. *Addict Behav*. 2002;27: 989-993.
28. Topooco N, Riper H, Araya R, et al. Attitudes towards digital treatment for depression: a European stakeholder survey. *Internet Interv*. 2017;8:1-9. doi:10. 1016/j.invent.2017.01.001.
29. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: toward a unified view. *MIS Quart*. 2003;27:425-478. doi:10.2307/300 36540.
30. Taiwo A, Downe AG. The theory of user acceptance and use of technology (UTAUT): a meta-analytic review of empirical findings. *J Theor Appl Inf Technol*. 2013;49:48-58. http://www.jatit.org/volumes/Vol49No1/7Vol49No1.pdf. Accessed August 15, 2018.
31. Hennemann S, Beutel ME, Zwerenz R. Drivers and barriers to acceptance of web-based aftercare of patients in inpatient routine care: a cross-sectional survey. *J Med Internet Res*. 2016;18:e337. doi:10.2196/jmir.6003.
32. Ritterband LM, Thorndike FP, Cox DJ, Kovatchev BP, Gonder-Frederick LA. A behavior change model for internet interventions. *Ann Behav Med*. 2009;38:18-27. doi:10.1007/s12160-009-9133-4.
33. Janssen C, Sauter S, Kowalski C. The influence of social determinants on the use of prevention and health promotion services: results of a systematic literature review. *Psychosoc Med*. 2012;9:Doc07. doi:10.3205/psm000085.
34. Apolinário-Hagen J, Kemper J, Sturmer C. Public acceptability of e-mental health treatment services for psychological problems: a scoping review. *JMIR Ment Health*. 2017;4:e10. doi:10.2196/mental.6186.
35. Crisp DA, Griffiths KM. Participating in online mental health interventions: who is most likely to sign up and why? *Depress Res Treat*. 2014;2014:790457. doi:10.1155/2014/790457.
36. Batterham PJ, Calear AL. Preferences for internet-based mental health interventions in an adult online sample: findings from an online community survey. *JMIR Ment Health*. 2017;4:e26. doi:10.2196/mental.7722.
37. Eichenberg C, Wolters C, Brahler E. The internet as a mental health advisor in Germany—results of a national survey. *PLoS ONE*. 2013;8:e79206. doi:10.1371/ journal.pone.0079206.
38. Hennemann S, Witthöft M, Bethge M, Spanier K, Beutel ME, Zwerenz R. Acceptance and barriers to access of occupational e-mental health: cross-sectional

findings from a health-risk population of employees. *Int Arch Occup Environ Health*. 2018;91:305-316. doi:10.1007/s00420-017-1280-5.

39. March S, Day J, Ritchie G, et al. Attitudes toward e-mental health services in a community sample of adults: online survey. *J Med Internet Res*. 2018;20:e59. doi:10.2196/jmir.9109.

40. Ajzen I. Nature and operation of attitudes. *Annu Rev Psychol*. 2001;52:27-58. doi:10.1146/annurev.psych.52.1.27.

41. Dwivedi YK, Rana NP, Jeyaraj A, Clement M, Williams MD. Re-examining the unified theory of acceptance and use of technology (UTAUT): towards a revised theoretical model. *Inf Syst Front*. 2019;21:719-734. doi:10.1007/s10796-017-9774-y.

42. Apolinário-Hagen J, Fritsche L, Bierhals C, Salewski C. Improving attitudes toward e-mental health services in the general population via psychoeducational information material: a randomized controlled trial. *Internet Interv*. 2018;12:141-149. doi:10.1016/j.invent.2017.12.002.

43. Zhao Y, Ni Q, Zhou R. What factors influence the mobile health service adoption? A meta-analysis and the moderating role of age. *Int J Inform Manage*. 2018;43:342-350. doi:10.1016/j.ijinfomgt.2017.08.006.

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

45. Ebert DD, Berking M, Cuijpers P, Lehr D, Portner M, Baumeister H. Increasing the acceptance of internet-based mental health interventions in primary care patients with depressive symptoms. A randomized controlled trial. *J Affect Disord*. 2015;176:9-17. doi:10.1016/j.jad.2015.01.056.

46. Breil B, Kremer L, Hennemann S, Apolinario-Hagen J. Acceptance of mHealth apps for self-management among people with hypertension. *Stud Health Technol Inform*. 2019;267:282-288. doi:10.3233/SHTI190839.

47. McCrae RR, Costa PT. Chapter 31. Conceptions and correlates of openness to experience. In Hogan R, ed. *Handbook of Personality Psychology*. San Diego, CA: Academic Press; 1997:825-847.

48. Flynn KE, Smith MA. Personality and health care decision-making style. *J Gerontol B Psychol Sci Soc Sci*. 2007;62:P261-P267.

49. Ferguson E. Personality is of central concern to understand health: towards a theoretical model for health psychology. *Health Psychol Rev*. 2013;7:S32-S70. doi:10.1080/17437199.2010.547985.

50. Connor-Smith JK, Flachsbart C. Relations between personality and coping: a meta-analysis. *J Pers Soc Psychol*. 2007;93:1080-1107. doi:10.1037/0022-3514.93.6.1080.

51. Ervasti M, Kallio J, Määttänen I, Mäntyjärvi J, Jokela M. Influence of personality and differences in stress processing among Finnish students on interest to use a mobile stress management app: survey study. *JMIR Ment Health*. 2019;6:e10039. doi:10.2196/10039.

52. Rogers EM. *Diffusion of Innovations*. 5th ed. New York, NY: Free Press; 2003. https://books.google.de/books?id=9U1K5LjUOwEC.

53. Apolinário-Hagen J, Harrer M, Kählke F, Fritsche L, Salewski C, Ebert DD. Public attitudes toward guided internet-based therapies: web-based survey study. *JMIR Ment Health*. 2018;5:e10735. doi:10.2196/10735.

54. Rogers RW. A protection motivation theory of fear appeals and attitude change. *J Psychol*. 1975;91:93-114. doi:10.1080/00223980.1975.9915803.

55. Apolinário-Hagen J, Hennemann S, Fritsche L, Drüge M, Breil B. Determinant factors of public acceptance of stress management apps: survey study. *JMIR Ment Health*. 2019;6:e15373. doi:10.2196/15373.

56. Hayes JF, Maughan DL, Grant-Peterkin H. Interconnected or disconnected? Promotion of mental health and prevention of mental disorder in the digital age. *Br J Psychiatry*. 2016;208:205-207. doi:10.1192/bjp.bp.114.161067.

57. Kemmeren LL, van Schaik A, Smit JH, et al. Unraveling the black box: exploring usage patterns of a blended treatment for depression in a multicenter study. *JMIR Ment Health*. 2019;6:e12707. doi:10.2196/12707.

58. Wallin EEK, Mattsson S, Olsson EMG. The preference for internet-based psychological interventions by individuals without past or current use of mental health treatment delivered online: a survey study with mixed-methods analysis. *JMIR Ment Health*. 2016;3:e25. doi:10.2196/mental.5324.

59. Wentzel J, van der Vaart R, Bohlmeijer ET, van Gemert-Pijnen JE. Mixing online and face-to-face therapy: how to benefit from blended care in mental health care. *JMIR Ment Health*. 2016;3:e9. doi:10.2196/mental.4534.

60. Plümer KD. *European Observatory on Health Systems and Policies*. Geneva: World Health Organization; 2018.

61. Busse R, Blümel M, Knieps F, Bärnighausen T. Statutory health insurance in Germany: a health system shaped by 135 years of solidarity, self-governance, and competition. *Lancet*. 2017;390:882-897. doi:10.1016/S0140-6736(17)31280-1.

62. Faul F, Erdfelder E, Lang A-G, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39:175-191.

63. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988. http://www.loc.gov/catdir/enhancements/fy0731/88012110-d.html.

64. Satow L. B5T—Psychomeda Big-Five-Persönlichkeitstest. https://www.psycharchives.org/handle/20.500.12034/423.

65. Klein EM, Brahler E, Dreier M, et al. The German version of the Perceived Stress Scale—psychometric characteristics in a representative German community sample. *BMC Psychiatry*. 2016;16:159. doi:10.1186/s12888-016-0875-9.

66. Klein B, Cook S. Preferences for e-mental health services amongst an online Australian sample? *EJAP*. 2010;6:28-39. doi:10.7790/ejap.v6i1.184.

67. Casey LM, Joy A, Clough BA. The impact of information on attitudes toward e-mental health services. *Cyberpsychol Behav Soc Netw*. 2013;16:593-598. doi:10.1089/cyber.2012.0515.

68. Ajzen I. The theory of planned behavior. *Organ Behav Hum Dec*. 1991;50:179-211. doi:10.1016/0749-5978(91)90020-T.

69. Musiat P, Goldstone P, Tarrier N. Understanding the acceptability of e—mental health—attitudes and expectations towards computerised self-help treatments for mental health problems. *BMC Psychiatry*. 2014;14:109. doi:10.1186/1471-244X-14-109.

70. Baumeister H, Nowoczin L, Lin J, et al. Impact of an acceptance facilitating intervention on diabetes patients' acceptance of internet-based interventions for depression: a randomized controlled trial. *Diabetes Res Clin Pract*. 2014;105:30-39. doi:10.1016/j.diabres.2014.04.031.

71. Federal Ministry of Health, Germany. Referentenentwurf des Bundesministeriums für Gesundheit: Entwurf eines Gesetzes für eine bessere Versorgung durch Digitalisierung und Innovation (Digitale Versorgung—Gesetz—DVG) [Draft bill of the German Federal Ministry of Health on digital healthcare law]. http://www.webcitation.org/78vcPGe5W. Updated May 15, 2019. Accessed June 6, 2019.

72. Hennemann S, Beutel ME, Zwerenz R. Ready for eHealth? Health professionals' acceptance and adoption of eHealth interventions in inpatient routine care. *J Health Commun*. 2017;22:274-284. doi:10.1080/10810730.2017.1284286.

73. Rongen A, Robroek SJW, van Ginkel W, Lindeboom D, Altink B, Burdorf A. Barriers and facilitators for participation in health promotion programs among employees: a six-month follow-up study. *BMC Public Health*. 2014;14:573. doi:10.1186/1471-2458-14-573.

74. Rongen A, Robroek SJW, van Ginkel W, Lindeboom D, Pet M, Burdorf A. How needs and preferences of employees influence participation in health promotion programs: a six-month follow-up study. *BMC Public Health*. 2014;14:1277. doi:10.1186/1471-2458-14-1277.

75. Andreou E, Alexopoulos EC, Lionis C, et al. Perceived Stress Scale: reliability and validity study in Greece. *Int J Environ Res Public Health*. 2011;8:3287-3298. doi:10.3390/ijerph8083287.

76. Hagmayer Y, Engelmann N. Causal beliefs about depression in different cultural groups—what do cognitive psychological theories of causal learning and reasoning predict? *Front Psychol*. 2014;5:1303. doi:10.3389/fpsyg.2014.01303.

77. Guo X, Han X, Zhang X, Dang Y, Chen C. Investigating m-Health acceptance from a protection motivation theory perspective: gender and age differences. *Telemed J E Health*. 2015;21:661-669. doi:10.1089/tmj.2014.0166.

78. Titzler I, Saruhanjan K, Berking M, Riper H, Ebert DD. Barriers and facilitators for the implementation of blended psychotherapy for depression: a qualitative pilot study of therapists' perspective. *Internet Interv*. 2018;12:150-164. doi:10.1016/j.invent.2018.01.002.

79. Schuster R, Pokorny R, Berger T, Topooco N, Laireiter A-R. The advantages and disadvantages of online and blended therapy: survey study amongst licensed psychotherapists in Austria. *J Med Internet Res*. 2018;20:e11007. doi:10.2196/11007.

80. Paslakis G, Fischer-Jacobs J, Pape L, et al. Assessment of use and preferences regarding internet-based health care delivery: cross-sectional questionnaire study. *J Med Internet Res*. 2019;21:e12416. doi:10.2196/12416.

81. Baumeister H, Reichler L, Munzinger M, Lin J. The impact of guidance on internet—based mental health interventions—a systematic review. *Internet Interv*. 2014;1:205-215. doi:10.1016/j.invent.2014.08.003.

82. Thom J, Bretschneider J, Kraus N, Handerer J, Jacobi F. Versorgungsepidemiologie psychischer Störungen. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*. 2019;62:128-139. doi:10.1007/s00103-018-2867-z.

83. Mack S, Jacobi F, Gerschler A, et al. Self—reported utilization of mental health services in the adult German population—evidence for unmet needs? Results of the DEGS1-Mental Health Module (DEGS1-MH). *Int J Methods Psychiatr Res*. 2014;23:289-303. doi:10.1002/mpr.1438.

84. van der Vaart R, Witting M, Riper H, Kooistra L, Bohlmeijer ET, van Gemert-Pijnen LJ. Blending online therapy into regular face-to-face therapy for depression: content, ratio and preconditions according to patients and therapists using a Delphi study. *BMC Psychiatry*. 2014;14:355. doi:10.1186/s12888-014-0355-z.

85. Talboom-Kamp EPWA, Verdijk NA, Kasteleyn MJ, Numans ME, Chavannes NH. From chronic disease management to person-centered eHealth; a review on the necessity for blended care. *Clin eHealth*. 2018;1:3-7. doi:10.1016/j.ceh.2018.01.001.