Optimizing the Supportive Context of Web-Based Self-Help in Individuals With Mild to Moderate Depressive Symptoms

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Bern, den Der Dekan Prof. Dr. Stefan Troche

To my grandparents, Trijntje & Johan Egbert

for their unconditional love

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Umbrella Paper

Feeling Accountable?

Using the Supportive Accountability Model to Discuss the HERMES Study that Aimed to Optimize the Outcome of and Adherence to a Web-Based Self-Help Program for Depressive Symptoms

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The cumulative dissertation includes the following four articles:

Article I

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Article II

Bur, O. T., Krieger, T., Moritz, S., Klein, J. P., & Berger, T. (2021). Optimizing the Context of Support to Improve Outcomes of Internet-Based Self-help in Individuals With Depressive Symptoms: Protocol for a Randomized Factorial Trial. *JMIR Research Protocols*, *10*(2), e21207. https://doi.org/10.2196/21207

Article III

Bur, O. T., Krieger, T., Moritz, S., Klein, J. P. & Berger, T. (2022). Optimizing the context of support of web-based self-help in individuals with mild to moderate depressive symptoms: A randomized full factorial trial. *Behaviour Research and Therapy*, *152*, 104070. https://doi.org/10.1016/j.brat.2022.104070

Article IV

Bur, O. T., Bielinski, L. L., Krauss, S., Häfliger, A., Guggisberg, J., Krieger, T., & Berger, T. Working Alliance Mediates the Effect of Guidance in a Web-Based Program for Participants With Mild to Moderate Depressive Symptoms: A Secondary Mediation Analysis. *Manuscript submitted to the journal Internet Interventions.*

At the end of the day, we are accountable to ourselves – our success is a result of what we do

- Catherine Pulsifer

Abstract

Web-based self-help programs have the potential to fill gaps in mental health care. There is now substantial evidence for the efficacy of web-based programs in reducing depressive symptoms. Thereby, programs with therapeutic support seem superior to programs without therapeutic support in terms of the outcome of and adherence to the programs. Although there is no comprehensive theoretical model explaining the treatment outcome, there are theoretical perspectives that explain adherence to web-based programs. One such model is the Supportive Accountability Model (SAM), which focuses on how human support affects participants' feelings of accountability. The central assumption of the model is that participants are more likely to engage with a program when they feel accountable to a person who provides support. The present umbrella paper discusses how well four factors, which potentially improve outcome of and adherence to web-based programs for depressive symptoms, correspond to the SAM conditions. These four factors were investigated in the HERMES study. The umbrella paper also discusses the HERMES study results regarding the SAM assumptions. While the factor guidance was provided according to the SAM, the remaining three factors either did not correspond to the model (i.e., the unguided motivational interviewing module and the automated emails) or only to some degree (i.e., the diagnostic telephone interview). The HERMES study results are in line with what the SAM would suggest. Human support in the form of guidance increases adherence, whereas factors without human support do not. Future studies should include accountability assessments to investigate whether the benefit from human support emerges through accountability. Furthermore, future studies might further investigate the role of adherence regarding the outcome, the possibility of evoking accountability without human support, and the possibility of participants feeling accountable to a study (or, in a broader sense, research).

Content

Introduction

Depressive disorders affect almost every fifth person at least once in their life (Kessler & Bromet, 2013). Such disorders reduce patients' quality of life and impair their daily functioning (Saarni et al., 2007; Wittchen et al., 2011). Since depressive disorders are expected to become a leading disability cause in high-income countries by 2030 (Mathers & Loncar, 2006), reducing the burden of depression is essential. Although psychotherapy and pharmacotherapy are both effective depression treatment options, not all depressed individuals receive adequate care (Boenisch et al., 2012; Cuijpers et al., 2020; Wang et al., 2007). In addition, global events such as the COVID-19 pandemic show that mental health care should be optimized (Holmes et al., 2020).

A promising possibility to reduce gaps in mental health care is web-based self-help programs (Kazdin & Blase, 2011). Crucial advantages are the potentially reduced costs, the fact that they can be used flexibly at any time and place, and that there is no need to see a health care professional in person (Berger et al., 2019; Schröder et al., 2022). In essence, web-based programs hold the potential to complement existing mental health care and improve access to treatment.

A web-based program delivers psychoeducational information and therapeutical exercises through an internet website. Most web-based programs are based on cognitive behavioral therapy (CBT) manuals, which can be readily translated into online formats (Andersson, 2009). However, there are also programs based on psychodynamic, problem-solving, or integrative psychotherapy treatments (Berger et al., 2019; Warmerdam et al., 2008). Web-based programs can be provided with (guided) or without therapeutical support (unguided).

There is substantial evidence for the efficacy of web-based programs for depression. A recent review of meta-analyses (N = 11) found that all meta-analyses reported significant

symptom reductions with moderate to large effect sizes (Taylor et al., 2020). Those meta-analyses investigating human support during a web-based program reliably found human support benefitting participants. More precisely, most studies on guided programs reported higher treatment effects than studies on unguided programs (e.g., Carlbring et al., 2018; Karyotaki et al., 2021; Koelen et al., 2022; Moshe et al., 2021). Furthermore, studies on guided programs also reported higher adherence to treatment and higher treatment completion rates (Christensen et al., 2009; Domhardt et al., 2019; Koelen et al., 2022; Musiat et al., 2021).

Although guidance has been identified as a beneficial factor in web-based treatments, a comprehensive theoretical model explaining treatment outcome is lacking so far (Zagorscak, 2020). Consequently, it is largely unclear what has caused the considerably different effect sizes across studies on unguided programs (Hedges' g = -0.13 – 0.89; Karyotaki et al., 2017) and studies on guided programs (Hedges' g = 0.14 – 2.29; Moshe et al., 2021). Similarly, it is mostly unclear why some studies fail to find an effect at all (Clarke et al., 2002; Gilbody et al., 2015) or why studies are usually troubled by high dropout rates and low adherence (Chiu & Eysenbach, 2011; Eysenbach, 2005).

However, in contrast to the lack of theoretical models explaining outcome of web-based programs, several theoretical perspectives aim to explain adherence to web-based programs. A recent review has identified eight such theoretical perspectives (Ryan et al., 2018). The perspectives differ considerably in terms of adherence definitions and regarding the factors postulated to increase adherence. For example, whereas some perspectives defined adherence as the use of an intervention over time, others conflated adherence with the users' subjective experience with a program. Furthermore, whereas some models focused on the role of human support, others focused on the role of a program's aesthetics.

A model explicitly focusing on the role of human support on adherence is the *Supportive Accountability Model* (SAM; Mohr et al., 2011). I will refer to this model throughout the umbrella paper for three reasons. First, as outlined, human support in the form of guidance seems a beneficial factor in web-based programs. Second, in our study, we assessed adherence similarly to the SAM authors' definition of adherence (cf. Theoretical Background). Third, we guided our study participants according to the SAM propositions (cf. Study Factors and the SAM).

The Goal of the Umbrella Paper

The main goal of this umbrella paper was to discuss our study results regarding the SAM assumptions. Although the SAM focuses on human support, it also provides a basis for thought on factors without human support. Of note, I could not directly test the SAM assumptions because we did not include accountability assessments in our study.

Before the discussion, I first introduce the SAM and the concept of working alliance. Then, I outline the study's goal and review empirical findings that built the foundation of our study. After that, I briefly describe the study design, the web-based program, and how our study factors correspond to the SAM. I report our study results immediately before the discussion.

Theoretical Background

Adherence

With the term *adherence*, I refer to the definition of Mohr et al. (2011, p.1), who defined it as the "use of the eHealth intervention over time." How adherence has been assessed varies across studies. However, most studies used relatively objective adherence measures such as the number of completed modules, logins, or online activities as well as

time spent online (Donkin et al., 2011; Mohr et al., 2011). Details on how we measured adherence in our study can be found in Article III.

Supportive Accountability Model

The SAM proposes that human support increases adherence to a web-based program. The model's central assumption is that users are more likely to engage with a program when they feel accountable to a person who provides support (Mohr et al., 2011). Accountability "refers to the implicit or explicit expectations that an individual may be called upon to justify his or her actions or inactions" (Mohr et al., 2011, p.2). For users to feel accountable and accept the influence of another person, they have to perceive them as legitimate. Furthermore, the SAM proclaims that an emotional attachment (i.e., bond) between a user and a treatment provider likely enhances the effect of accountability.

The SAM builds on literature from organizational psychology, motivation theory, and computer-mediated communication research. It outlines how internet treatments should provide human support to evoke accountability. According to the model, the following factors influence accountability:

- The social presence of a human being
- Clear expectations about the process and behavior in a web-based program rather than expectations about a particular outcome (such as reducing depressive symptoms)
- Appropriate and shared goal setting. Goals have clear aims tied to larger life goals and values and should not be adherence-based. Goals solely set by treatment providers might reduce adherence
- Justified and reasonable performance monitoring is agreed upon in advance and serves only to provide feedback. Treatment providers should not appear to act controlling since this could reduce adherence

- The legitimacy of a treatment provider. On the one hand, legitimacy is given by an instrumental factor (users perceive the treatment provider as having expertise and the contact with them is reciprocal). On the other hand, legitimacy is given by a relational factor (users trust the treatment provider and perceive them as benevolent)
- The bond between a patient and a treatment provider

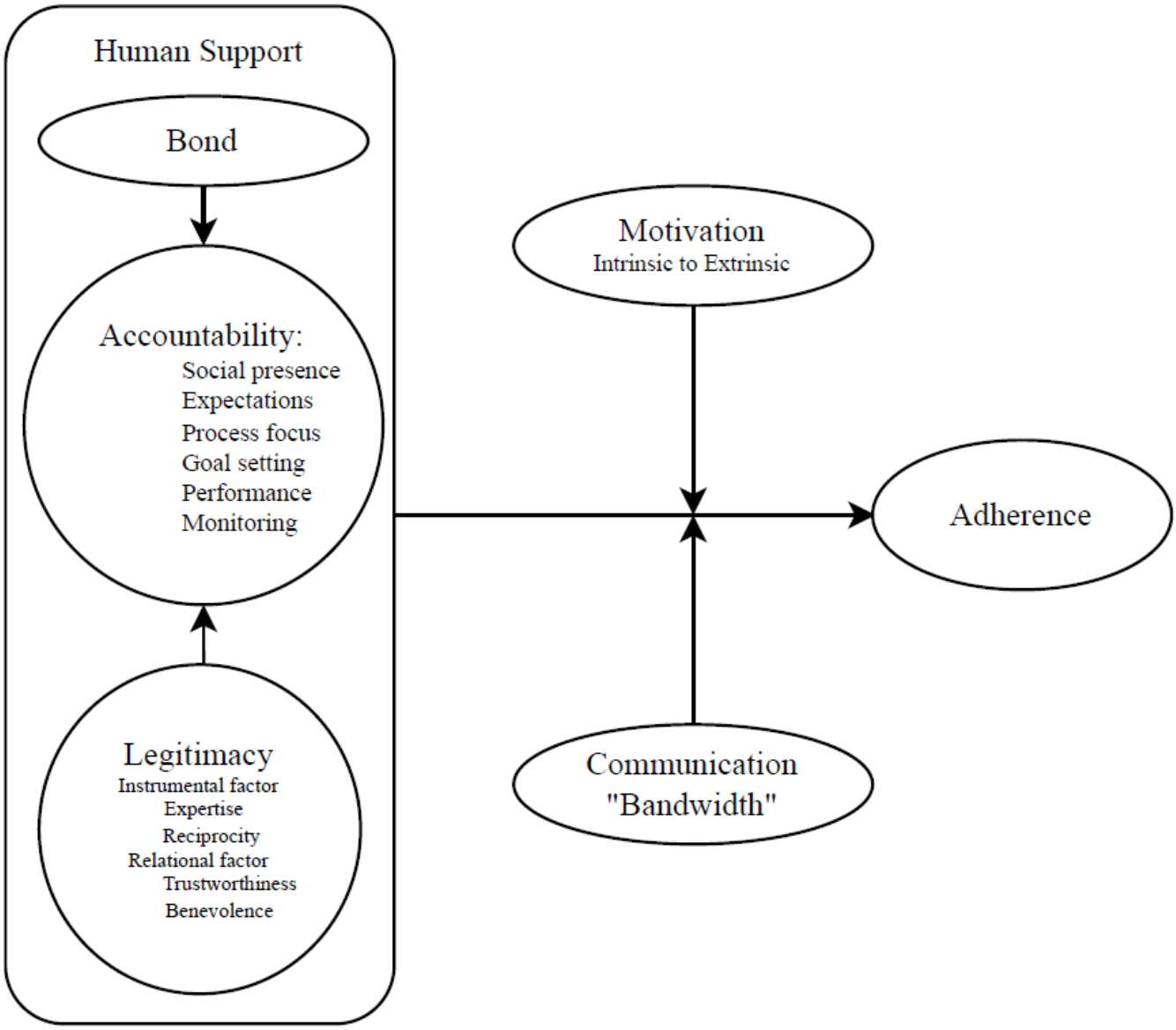
Furthermore, the SAM proposes two factors moderating the relationship between accountability and adherence. The first factor is the mode of communication through which support is provided. Communication modes differ in the number of present communication cues (e.g., verbal content, non-verbal cues). These differences in the various modes (face-to-face, telephone, email, or chat) are suggested to influence factors such as legitimacy, bond, and accountability.

The second factor is the participants' motivation, which is understood as a gradient from extrinsic to intrinsic motivation. Motivation as a moderating effect could explain why a few participants can profit from unguided self-help (about one eighth or one ninth of participants). These participants may be sufficiently intrinsically motivated throughout treatment and therefore not need any form of guidance. In contrast, most other participants might be motivated at the beginning of the treatment. However, they might need external human support to maintain motivation throughout treatment.

The assumption of accountability increasing adherence to treatments has been hardly investigated. Although (Duffecy et al., 2013) introduced a measure for supportive accountability almost a decade ago, only two studies on weight loss seemed to have used it. A third study used a newer form of a supportive accountability assessment (Meyerhoff et al., 2021). All studies found that accountability and adherence were positively associated with one another. However, they did not find accountability to predict the outcome (Chhabria et al., 2020; Dennison et al., 2014; Meyerhoff et al., 2021).

Figure 1

The Supportive Accountability Model



Note. Adapted from Mohr et al. (2011)

Working Alliance

As has been mentioned before, a comprehensive theoretical model explaining outcome in internet treatment is lacking so far. However, research has identified several process variables that seem related to outcome, a central one being the working alliance. The concept

of the working alliance was introduced by Bordin (1979), who defined it as (a) the emotional bond between a patient and a therapist, (b) shared agreement with the tasks of therapy, and (c) shared agreement with the goals of therapy. The working alliance has been thoroughly studied as a process variable in face-to-face psychotherapy and has been found to predict outcomes (Flückiger et al., 2018; Horvath et al., 2011). The working alliance seems also to be important in online therapy. Client-rated alliance scores have been found to be high, independent of communication modalities, diagnostic groups, and amount of contact between clients and therapists (Berger, 2017; Pihlaja et al., 2018). For guided web-based programs, most studies found the working alliance being associated with outcomes (*r*s = .203 – .275; Flückiger et al., 2018; Kaiser et al., 2021; Probst et al., 2019). Interestingly, whereas the emotional bond between patient and therapist seems to be of lesser importance than in face-to-face therapies, the agreement on tasks and goals seems to be more critical in web-based programs (Berger, 2017; Gómez Penedo et al., 2020; Probst et al., 2019)

The HERMES Study

The main goal of the HERMES study was to investigate how the support context of web-based self-help programs for depression can be optimized. The term *support context* refers to all possible interventions and factors accompanying a web-based program. These factors can be provided before or during a program and can include forms of human or automated support.

In our study, we investigated four factors that potentially improve the outcome of and adherence to web-based program. Two human contact factors were (a) guidance of participants during the eight weeks of treatment and (b) a diagnostic interview (DI) through the telephone before the treatment began. Two automated factors were (c) a preintervention module based on motivational interviewing techniques (MI; Miller & Rollnick, 2012), and (d) automated emails (AE).

Empirical Background

We included the four factors in our study based on a considerable body of research. Apart from research on guidance, which has been outlined already, this research can be summarized as follows. Johansson and Andersson (2012) suggested that contact with treatment providers other than guidance, such as diagnostic assessments or the recruitment procedure in a study, could improve outcome and adherence. A study about a web-based program for social anxiety found participants showing more considerable improvements in secondary outcomes and higher treatment adherence if they had undergone a diagnostic assessment at the beginning of treatment (Boettcher, et al., 2012). In contrast to this finding, however, a recent study about a web-based program for alcohol misuse did not find any additional benefit of a diagnostic assessment (Sundström et al., 2022).

Further findings have suggested that automatized forms of support before or during a program might also improve outcome and adherence. For example, automated feedback emails during treatment have shown to be equally effective as semi-standardized feedback (i.e., guidance) by treatment providers (Zagorscak et al., 2018). In another study, automated emails (AE) improved overall completion rates and the outcome for a subsample with elevated comorbid symptoms (Titov et al., 2013). Furthermore, a meta-analysis found AE being associated with a lower likelihood of dropping out of treatment (Furukawa et al., 2021).

Another factor that can be automated and might improve the outcome of and adherence to a program is enhancing participants' motivation with MI (Miller & Rollnick, 2012). MI is a counseling style to address resistance and ambivalence towards positive behavior change. A central purpose of MI is to help participants resolve their resistance or ambivalence. Thereby, MI influences participants to make changes. In face-to-face studies, MI has been associated with large treatment effect sizes and high adherence (Hettema et al., 2005). In studies on web-based programs, MI did not improve symptomatic outcomes.

However, MI was associated with higher treatment completion in a social anxiety study and with more days spent in treatment in a transdiagnostic study (Soucy et al., 2021; Titov et al., 2010).

Methods

To investigate the main and interaction effects of all four factors within one trial, we used a factorial design. This research design disentangles the specific effects of several factors within the same treatment package (Collins & Kugler, 2018). It is a time-efficient strategy to optimize treatments because it can reveal whether the individual factors do or do not influence an outcome variable. Furthermore, it can reveal whether factors interact with one another, which provides information on whether the factors in question should or should not be provided simultaneously.

The advantage of a factorial trial over a randomized controlled trial is that it seems more suitable for optimizing treatments since it estimates the effect of several factors. However, a limitation of the factorial trial is that it cannot establish the efficacy of the whole treatment. For that purpose, randomized controlled trials are still the gold standard (Collins & Kugler, 2018; Watkins & Newbold, 2020).

The Web-Based Program

HERMES is a web-based problem-solving therapy (PST) program developed at the University of Bern. It consists of a general introduction to the rationale of PST and three toolkits. The self-help program content is displayed through text, audio, and videos, including case examples and several exercises. The toolkits are organized around the subjects of feeling, thinking, and acting, which include several topics. Toolkit 1 (Feeling) deals with mindfulness, emotion observation and regulation, and relaxation. Toolkit 2 (Thinking) deals with self-criticism, cognitive restructuring, and healthy thinking. Toolkit 3 (Acting) deals with defining

problems, thinking of, and choosing solutions, acting out a solution plan, and evaluating problem-solving attempts.

PST is generally considered under a cognitive-behavioral framework and is used as a psychotherapy approach and a brief program to improve problem-solving skills (Nezu et al., 2012). PST has two main treatment goals aiming to enhance individuals' ability to cope more effectively with minor and major stressors:

1. Promote a positive problem orientation while minimizing a negative problem orientation
2. Implement specific rational problem-solving behaviors while minimizing impulsive and careless reactions to problems

The major obstacles to achieving these two goals are a) the presence of cognitive overload, b) poor emotion regulation skills, c) biased cognitive processing, d) feelings of hopelessness, and e) ineffective problem-solving skills. To overcome these obstacles, PST helps individuals train several coping skills they can use to deal with negative emotions, negative thinking, and impulsive or careless problem-solving attempts. According to theory, better coping and rational problem-solving should then, in turn, lead to a reduction of psychological symptoms.

PST has shown to be efficacious for handling and adapting to various physical problems and reducing symptoms of mental health problems, including depression (Nezu & D'Zurilla, 2006). In a meta-analysis, the authors found PST being equally effective as other bona fide psychotherapeutic treatments (Malouff et al., 2007). Furthermore, there is evidence that, like CBT treatments, PST treatments can also be translated into web-based programs. Compared with a program based on CBT, a program based on PST proved to be equally effective in reducing depressive symptoms (Warmerdam et al., 2008).

Study Factors and the SAM

The treatment providers in our study guided participants following the SAM. They introduced themselves as psychologists and provided weekly feedback. The first few feedbacks were discussed with a Ph.D. student, and a clinical psychologist supervised the messages when in doubt. Furthermore, the treatment providers engaged in reciprocal communication and answered questions within three days. Treatment providers assured participants keeping any information confidential. They wrote the emails in a warm and supportive tone.

Furthermore, in the first email, treatment providers provided the reason for monitoring the participant's activity by stating that the feedback's purpose is to support the participant throughout the treatment. The feedback was focused on the process (e.g., the content of a completed exercise) and not on symptoms or adherence. In sum, apart from defining goals, the treatment providers guided participants in line with the SAM and should therefore have evoked accountability.

The human contact during the DI corresponded to fewer SAM conditions than guidance. As with guidance, treatment providers introduced themselves as psychologists and assured participants keeping any information confidential. Therefore, the treatment providers should have appeared legitimate. Furthermore, treatment providers should have evoked considerable social presence through the telephone, at least for the time during the interview. However, apart from legitimacy and temporary social presence, the DI met no other SAM conditions to evoke accountability. Even though treatment providers were instructed to behave supportively and warmly, they may not have appeared particularly benevolent. The DI was a rather directive and standardized assessment. Therefore, participants had little room to express concerns or problems.

Our study provided MI as an unguided module before the main program. This intervention did not correspond to any SAM conditions. There was no communication with or social presence of a human being that participants could have perceived as a legitimate influence. According to the SAM, MI should not have influenced participants' accountability.

Furthermore, we sent AE during the program. Like MI, the AE did not correspond to any SAM conditions. The fact that a human originally wrote the emails unlikely evoked accountability.

Results and Articles

In Article I, *Internet-based psychotherapeutic interventions*, we overviewed different forms of web-based interventions and their efficacy and introduced related definitions and terms. The web-based interventions are categorized according to the two dimensions of how (automated vs. face-to-face) and where (at a distance vs. on-site) they are provided. Furthermore, we summarised recent developments and the current state of research and practice. We discussed web-based interventions' potentials and risks and addressed the concerns and challenges raised by the new treatment formats. We concluded with the current state of implementation of web-based interventions in routine care and suggested that interventions should be tested in the respective contexts in which they are provided.

In Article II, *Optimizing the Context of Support to Improve Outcomes of Internet-Based Self-help in Individuals With Depressive Symptoms: Protocol for a Randomized Factorial Trial*, we described the HERMES study background and rationale and outlined our objectives. Furthermore, we described the study design and the associated statistical and power considerations.

In Article III, *Optimizing the context of support of web-based self-help in individuals with mild to moderate depressive symptoms: A randomized full factorial trial*, we investigated

the influence of four potentially supportive factors on the outcome of and adherence to the self-help program HERMES. The main results were that guided participants were less depressed post-treatment and showed higher treatment adherence than unguided participants. At follow-up, unguided participants had caught up in depressive symptom improvement (i.e., the two groups no longer differed). The remaining three factors (DI, MI, AE) had no significant effect on depressive symptom reduction or treatment adherence. Whereas guided participants were more likely to complete post-treatment questionnaires, participants with a DI were more likely to complete follow-up questionnaires. There was a small positive association between adherence and depressive symptom improvement.

In Article IV, *Working alliance mediates the effect of guidance in a web-based program for participants with mild to moderate depressive symptoms: A secondary mediation analysis*, we took a closer look at the finding that guided participants were less depressed post-treatment than unguided participants. Thereby, we investigated whether the working alliance played a role in explaining this result. There were three main findings. First, guided participants indicated a higher working alliance than unguided participants. Second, the working alliance was associated with an improvement of depressive symptoms from pre- to post-treatment. Third, the working alliance mediated the relationship between guidance and depressive symptoms post-treatment. Furthermore, the subscale tasks was associated with the outcome at both time points (i.e., early- and post-treatment), the subscale goals was associated with the outcome at post-treatment, and the subscale bond was not associated with the outcome at either time point.

Discussion

In the following paragraphs, I discuss our study results regarding the SAM assumptions. Furthermore, I discuss the role of adherence and working alliance for a better outcome based on the results for guided participants. I do not include considerations of other

models regarding adherence or outcome. To conclude, I outline my considerations for future research.

Human Support Through Guidance

Our study results concerning guidance and adherence are interpretable with the human support hypothesis of the SAM. For example, Article III showed that guided participants adhered more to treatment and were less likely to drop out of treatment than unguided participants. Thus, the SAM assumption might hold; guidance increases accountability through various factors (such as treatment providers appearing socially present, focusing on the process, and providing feedback). Increased accountability, in turn, leads to higher adherence. Another result in line with the SAM assumption is guided participants bonding more strongly with the treatment providers (Article IV). According to the SAM, a bond to treatment providers likely increases the feeling of accountability. A further result in line with the SAM assumption is that in the time from post-treatment to follow-up, guided and unguided participants no longer differed regarding adherence. With the termination of guidance, social presence, feedback, and support of a treatment provider also ceased. Thus, it can be argued that guided participants no longer felt accountable to a treatment provider to engage with the program.

In Article III, we reported that guidance improved not only adherence to treatment but also the outcome post-treatment. Although the SAM authors state that human support improves outcomes, they do not outline how (Mohr et al., 2011). Therefore, I explore two hypotheses in the following paragraphs that could explain how guidance improves the outcome.

The first hypothesis on how guidance might improve the outcome is the following: guidance increases adherence, and, in turn, increased adherence improves outcome. The logic behind this hypothesis is that increased adherence might reflect participants engaging more

intensively with the program content and exercises. Therefore, they might experience a more pronounced symptom reduction. Our study found weak evidence for this hypothesis, i.e., a small but statistically significant correlation between adherence and outcome (Kendall's $\tau = .11$, $p = .025$). Although the adherence-outcome relationship has been found previously (Donkin et al., 2011; El Alaoui et al., 2016; Newby et al., 2014), not all studies find such a relationship (e.g., Donkin et al., 2013). Furthermore, in one study, the prediction of outcome by adherence was no longer significant when the authors added guidance to the regression model (Fuhr et al., 2018). In sum, the current state of the literature suggests that the influence of adherence on the outcome is at best weak.

The second hypothesis how guidance might improve the outcome is through the working alliance with a treatment provider. The SAM authors mention that the working alliance might be critical for the outcome. In Article IV, we found evidence for this hypothesis. First, guided participants reported a higher working alliance than unguided participants. Second, we replicated previous findings where the working alliance was associated with the outcome post-treatment (Berger, 2017; Gómez Penedo et al., 2020; Probst et al., 2019). Third, the working alliance mediated the relationship between guidance and outcome post-treatment. Thus, our findings suggest that the working alliance with a treatment provider benefits the outcome of web-based programs. With these findings in mind, it is worth considering the result of Fuhr et al. (2018) again. Since adherence no longer predicted the outcome when guidance was included in the model, it might be that guidance increased adherence and improved outcome through different mechanisms. Guidance might have increased adherence through accountability, whereas it might have improved the outcome through the working alliance.

Of note, the working alliance subscales tasks and goals seem more critical regarding the outcome than the subscale bond. The subscale tasks was associated with the outcome at

both time points (i.e., early- and post-treatment), and the subscale goals was associated with the outcome at post-treatment. In contrast, the subscale bond was not associated with the outcome at either time point. Therefore, it might be more important that participants agree with the tasks and goals of a web-based program, or put differently, that they perceive a program as fitting (Berger, 2017; Gómez Penedo et al., 2020; Probst et al., 2019). However, according to the SAM, bonding with treatment providers is regarded as a factor likely increasing accountability. Thus, it might nevertheless be important that participants and treatment providers establish an emotional bond.

A question arising from previous considerations on accountability and working alliance is how these two concepts might be related. There are several possibilities. One possibility is that both concepts are independent of one another. In that case, accountability might or might not influence outcome or adherence regardless of the working alliance. Another possibility could be that the concepts are related to one another, and one preceding the other. In the first case, participants might feel accountable to treatment providers and then build a working alliance with them. In the second case, participants might establish a working alliance with treatment providers and then feel accountable to them. I argue that the latter possibility is more likely than the former. First, the second possibility would be in line with the SAM, which assumes that a bond with the person providing support influences accountability. Second, one of our study results points in the same direction. In Article IV, we reported that two weeks after treatment began, guided participants already indicated a higher working alliance than unguided participants. Since this was quite early in treatment, it speaks for the possibility that a working alliance emerges before accountability. Intuitively, this makes sense. Participants are probably more likely to feel accountable to someone they already like.

Human Contact Through a Diagnostic Interview

Besides guiding participants, treatment providers in our study also contacted participants by telephone to conduct a DI before treatment began. Although the DI was associated with a higher likelihood of completing treatment, it had no significant effect on adherence as we assessed it. Three apparent differences between a DI and guidance might explain why that was. First, guided participants received feedback on their treatment process, whereas participants with a DI did not get any feedback regarding their problems, symptoms, or possible diagnoses. In other words, participants should have perceived guidance as a supportive intervention, whereas participants likely perceived the DI as an intervention to only assess their symptoms. Second, guided participants experienced a continuous email conversation with treatment providers during treatment. In contrast, participants with a DI had a short and one-time contact before the treatment began. Thus, guidance likely evoked the social presence of treatment providers over a more extended period, whereas the DI likely evoked social presence only during the interview. Third, the conversation with treatment providers during guidance was reciprocal. Guided participants not only received feedback but could also actively ask questions, express concerns, or comment on the feedback. In contrast, participants with a DI had a passive role during the interview by simply answering questions with yes or no. The comparison between guidance and the DI indicates that treatment providers were considerably less likely to establish legitimacy, social presence, or a bond during a DI. Based on these considerations, I would argue that a DI did not evoke accountability towards treatment providers.

Surprisingly, participants with a DI showed a higher likelihood of filling in follow-up questionnaires. Although this might be an incidental finding, there is another plausible explanation. The DI was likely perceived as part of the study procedure, similar to completing the consent form or questionnaires. Since the DI is a demanding and time-consuming

procedure, participants might have been engaging in reducing cognitive dissonance as to why they endured the DI. Therefore, although a DI did not seem to evoke accountability towards treatment providers, it might have evoked a feeling of accountability towards the study procedures. Because web-based programs are to be used in routine care, this would be an essential finding. Increased accountability to a study is helpful for research because there are less missing data. However, this form of accountability is of no benefit to the participants if it does not increase adherence or improve symptoms. Therefore, from an ethical point of view, a DI should only be conducted if a study or a treatment requires and uses its data.

Automated Support

Apart from human support factors, we investigated two automated forms of support in our study (i.e., MI and AE). Both factors had neither an effect on outcome nor adherence. Concerning adherence, the findings are what one would expect according to SAM assumptions. Both factors were not delivered by a human person; thus, participants should not have felt accountable to a treatment provider.

However, concerning the AE, this explanation may be too simple when considering the results of two previous studies. In one study, Zagorscak et al. (2018) found automated feedback being equally effective as semi-standardized feedback (i.e., guidance). In another study, Titov et al. (2013) found AE increasing completion rates of participants with elevated co-occurring symptoms. What differentiates the AE in these two studies from the AE in our study is that, although the messages were not provided by humans either, they included some SAM characteristics. In the study of Zagorscak et al. (2018), the emails provided general and non-individualized feedback. In the study of Titov et al. (2013), some emails were sent in direct response to participants' (non)-activity. That is, participants received emails when they completed a lesson or when they had not started a lesson within a week. Thus, participants received feedback based on their automatically monitored (non)-behavior. In contrast, the AE

in our study informed participants how far they should be in the program and suggested content to work on next. These emails were sent to all participants of the AE groups irrespective of their behavior within the program. Therefore, it could be that AE responding to participants' (non)-activity or providing general feedback could lead to a sense of accountability.

The SAM recognizes motivation as a moderator of the relationship between accountability and adherence. Therefore, it could have been that MI would have increased adherence for participants with low motivation. Since we found no effect of MI on adherence (Article III), we speculated that participants in our study were already highly motivated at the treatment beginning, as in another study (Soucy et al., 2021). Thus, a MI intervention could not have increased the motivation of our participants because it was already sufficiently high. What speaks in favor of this assumption is that our participants were self-selected. Self-selection implies considerable participant motivation because participants must actively approach the study and its providers.

Nevertheless, unguided MI might still influence the relationship between accountability and adherence. For example, treatment providers might detect participants' resistance or ambivalence towards treatment after it began. For such participants, unguided MI could be helpful to resolve their resistance or ambivalence and increase motivation. However, it might be that MI cannot be translated into an unguided module but requires a human person to provide it to develop its effect. Other than the potential MI benefits, the additional human contact might increase participants' accountability toward treatment providers. Furthermore, treatment providers engaging in MI could deal more accordingly with the causes of participants' resistance or ambivalence. If participants resist changing something in their life, treatment providers could help participants to dissolve the resistance. On the other hand, if participants are not satisfied with the treatment, treatment providers could offer

other forms of treatment. Of note, a significant disadvantage would be the additional required resources of treatment providers.

Prospects and Conclusion

A shortcoming of my considerations was that we had not assessed accountability in our study. Therefore, I had to assume that the central SAM assumption was valid: accountability increases adherence. Although some studies have found evidence for this assumption, research should further test it (Chhabria et al., 2020; Dennison et al., 2014; Meyerhoff et al., 2021). To this end, future studies should assess accountability and test its influence on adherence. By assessing accountability, researchers could also examine how it relates to the working alliance and shed light on the assumptions of working alliance preceding and influencing accountability.

Despite the mentioned shortcoming, our study results are well compatible with the SAM assumptions. Human support in the form of guidance increases adherence, and this might be because participants feel accountable to treatment providers. In contrast, both factors without human support (i.e., MI and AE) do not increase adherence, which might be because participants do not interact with a treatment provider, and, consequently, do not feel accountable to someone.

Strictly speaking, the DI was not a supportive intervention. Therefore, the DI not increasing adherence fits the SAM because the DI should not have evoked accountability to treatment providers. However, I argued that the DI might have evoked a form of accountability towards the study (or, in a broader sense, research) since it led to higher completer rates at follow-up. Investigating this assumption might be worthwhile because study accountability could partly explain why controlled study findings differ from routine care study findings.

In Article IV, we hypothesized that guidance could be limited to an initial phase of treatment and then transformed into guidance on demand. While this would free up treatment providers' resources, limited guidance might remain equally effective as regular guidance. If future research were to investigate this hypothesis, it would be worthwhile to assess accountability simultaneously. Through guidance on demand, treatment providers would still be socially present and give feedback on the participants' process upon request. It might be that guiding on demand is enough to evoke accountability.

Compared to the AE in our study, the AE in the studies by Zagorscak et al. (2018) and Titov et al. (2013) provided feedback on participants' (non-)behavior. The AE in these studies increased either adherence (Titov et a., 2013) or achieved similar results to guidance (Zagorscak et al., 2018). Thus, despite the results of our study, the question remains whether AE could improve accountability, for example, if they provide feedback.

Since the SAM considers participants' motivation a critical influence, future studies should repeatedly measure motivation. If motivation is measured at the beginning of treatment, it could inform whether pre-treatment MI is reasonable. If people are already sufficiently motivated, additional MI probably does not have a positive effect. If motivation is measured during treatment, one could look at the moderating effect of motivation on the relationship between accountability and adherence. Additional MI may not be needed for people motivated throughout the intervention. In contrast, MI may be beneficial for individuals whose motivation decreases during treatment. However, using MI during treatment for low-motivated individuals would require that the individuals concerned can still be identified. These people might not complete questionnaires because they have already dropped out of the study.

To conclude, our results align with the notion that accountability enhances engagement in treatment. Thus, although Catherine Pulsifer may be right when she says that

we are accountable to ourselves at the end of the day, she may miss an important detail. If, in addition, we feel accountable to someone we like, this may help us go a little further than we otherwise would.

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Appendices

Appendix A: Article I

Internet Interventionen in der Psychotherapie

Berger, T., Bur, O., & Krieger, T. (2019). Internet-Interventionen in der Psychotherapie. *PPmP-Psychotherapie· Psychosomatik· Medizinische Psychologie*, *69*(09/10), 413-426. https://doi.org/10.1055/a-0963-9055

Internet Interventionen in der Psychotherapie

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Die Erforschung und Anwendung internetbasierter psychosozialer Interventionen hat in den letzten Jahren rapide zugenommen. Das neue Behandlungsformat bietet viele Chancen, weckt aber auch Skepsis und Bedenken. Dieser Beitrag gibt einen Überblick über verschiedene Formen von Internet Interventionen, neuere Entwicklungen und den aktuellen Stand in Forschung und Praxis.

1. Einleitung

Die Entwicklung und der Einsatz internetbasierter psychotherapeutischer Interventionen hat in den letzten Jahre rapide zugenommen. Gründe für diese Entwicklung sind:

- *Der technologische Fortschritt*, der die Entwicklung und Verbreitung internetbasierter Interventionen angetrieben hat;
- *die gesellschaftliche Entwicklung*, dass Menschen sich in vielen Bereichen an den Gebrauch des Internets gewöhnt haben;
- *die Nachfrage nach psychosozialer Unterstützung,* die durch das bestehende Versorgungsangebot nicht vollumfänglich abgedeckt werden kann;
- *die zunehmende Spezifizierung und Standardisierung psychotherapeutischer Methoden*, die eine computergestützte Vermittlung therapeutischer Inhalte erleichtert hat; sowie
- *die vielversprechenden Wirksamkeitsnachweise für bestimmte internetbasierte Interventionen,* die dazu geführt haben, dass immer neue Forschungsprojekte finanziert und die Verbreitung entsprechender Interventionen in verschiedenen Ländern vorangetrieben werden.

2. Überblick über verschiedene Internet Interventionen

2.1. Definition und Begriffe

In den letzten Jahren hat sich der Oberbegriff *Internet Interventionen* für alle psychosozialen Angebote etabliert, die unter Nutzung des Mediums Internet das Ziel verfolgen, Betroffene bei der Bewältigung einer psychischen Symptomatik zu unterstützen und ihr präventiv entgegenzuwirken. Andere häufig verwendete Begriffe spezifizieren inhaltliche Ansätze (z.B. *iCBT* für *Internet-based cognitive-behavioral therapy*), verwendete Kommunikationsmittel (z.B. *Email-, Chat-* oder *Video-Therapie*) oder verschiedene Interventionsformate (z.B. *Angeleitete Selbsthilfeansätze* oder *Blended Psychotherapien*).

2.1. Verortung verschiedener Interventionsformate

Abb. 1 verortet die häufigsten Interventionsformate entlang zweier Dimensionen:

- Die erste Dimension betrifft den Grad der Automatisierung bzw. die Frage, ob die Intervention automatisiert durch Selbsthilfeprogramme, Apps und Chatbots oder aber persönlich von Therapeutinnen und Therapeuten vermittelt wird.
- Die zweite Dimension bezieht sich auf das Verhältnis von Therapieelementen, die auf Distanz versus vor Ort vermittelt werden.

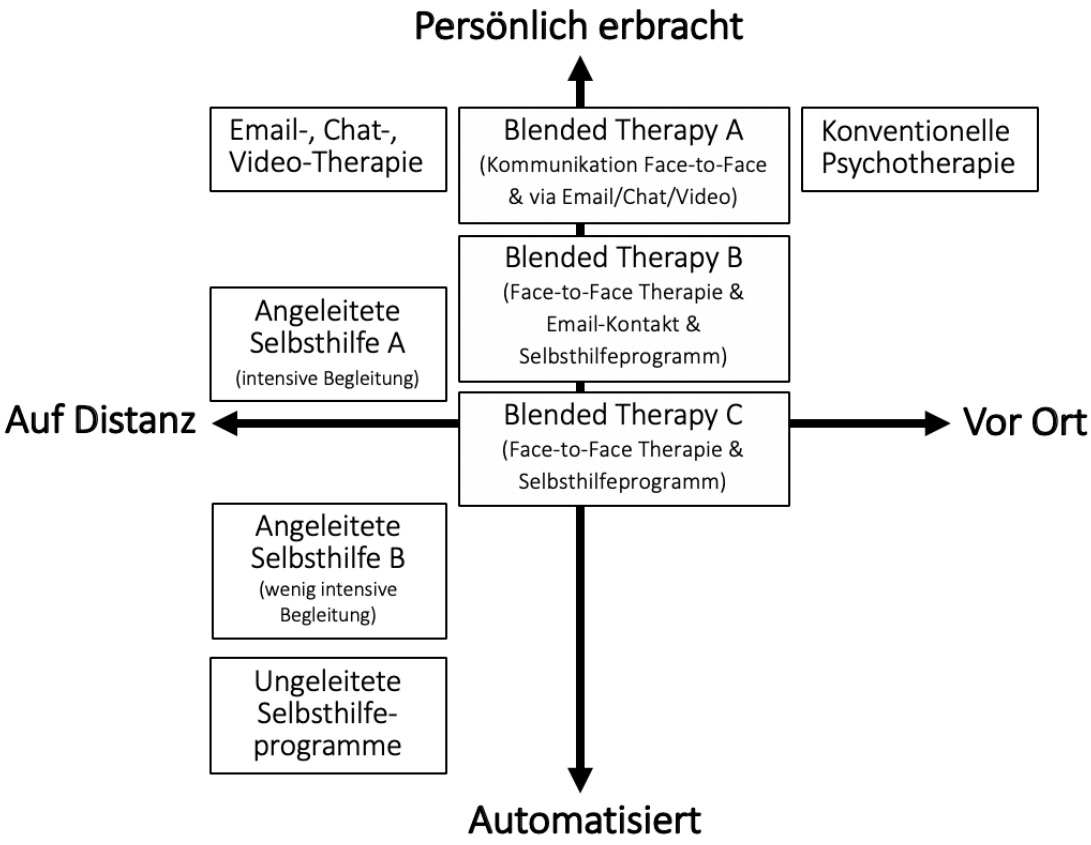

Abb. 1 Verortung verschiedener Internet Interventionen auf zwei Dimensionen (adaptiert nach [1])

2.1.1. Ungeleitete und angeleitete Selbsthilfeprogramme

Besonders gut erforscht sind *webbasierte Selbsthilfeprogramme*, die Teilnehmende ganz aus eigener Kraft (*ungeleitete Selbsthilfe*) oder mit unterstützenden Online-Kontakten mit Fachpersonen (*angeleitete Selbsthilfe*) bearbeiten. In den Selbsthilfeprogrammen werden psychoedukative Informationen und therapeutische Übungen bereitgestellt, die meist auf störungsspezifischen, kognitiv-verhaltenstherapeutischen Manualen basieren. Es gibt aber auch transdiagnostisch ausgerichtete Programme und solche die psychodynamischen oder integrativen Ansätzen folgen. Die Programme sind meist in verschiedene Module oder Sitzungen aufgeteilt, die in vorgegebenen Zeiten, zum Beispiel ein Modul pro Woche, bearbeitet werden sollen. Inzwischen können die meisten Programme auf verschiedenen Endgeräten, von PC bis Smartphone, nutzerfreundlich verwendet werden. In **Tab. 1** sind die Inhalte eines solchen Programms am Beispiel eines webbasierten Selbsthilfeprogramms für verschiedene Angststörungen aufgeführt [2].

Tab. 1 Inhalt eines webbasierten Selbsthilfeprogramms zur Behandlung verschiedener Angststörungen [2]

Modul 1	• Motivationsarbeit (z.B. Erarbeiten von Gründen, die für die Arbeit an den Ängsten sprechen; Definieren von individuellen Zielen) • Einführen eines Online-Angsttagebuchs • Einführung in die angewandte Entspannung
Modul 2	• Psychoedukation: Informationen zu Angst und Angststörungen. Erklären von wichtigen aufrechterhaltenden Faktoren von Angststörungen und Vermitteln wichtiger Komponenten des kognitiv-behavioralen Behandlungsansatzes (z.B. negative Gedanken, Vermeidungsverhalten, Aufmerksamkeitsprozesse, Sicherheitsverhalten). • Informationen zum Behandlungsrational • Entwicklung eines eigenen, individuellen Erklärungsmodells der Angst • Übung zur angewandten Entspannung
Modul 3	• Kognitive Restrukturierung: Identifizieren und Hinterfragen dysfunktionaler negativer Gedanken und Annahmen. • Einführen eines Online-Gedankentagebuchs • Übung zur angewandten Entspannung
Modul 4	• Informationen und Übungen zur Reduktion der selbstfokussierten Aufmerksamkeit • Achtsamkeitsübungen • Übung zur angewandten Entspannung
Modul 5	• Exposition und Verhaltensexperimente: Planen und Durchführen von In-Vivo-Expositionen • Einführen eines Online-Expositionstagebuchs • Sorgenkonfrontation, Einführen eines Grübelstuhls • Übung zur angewandten Entspannung
Modul 6	• Zusammenfassung und Repetition • Weiterführen von In-Vivo-Expositionen und Verhaltensexperimenten
Modul 7	• Informationen zur Rolle von Stress und gesundheitsförderlichem Verhalten bei Angststörungen • Problemlösetraining
Modul 8	• Zusammenfassung • Informationen zur Rückfallprävention

In an*geleiteten Selbsthilfeansätzen* werden Patientinnen und Patienten während der Arbeit mit einem Selbsthilfeprogramm mit kurzen wöchentlichen Email-Kontakten unterstützt (siehe *Fallbeispiel Angeleitete Selbsthilfe*). Diese Unterstützung kann mehr oder weniger intensiv sein (siehe **Abb. 1**). Eine wenig intensive Unterstützung beinhaltet meist ein kurzes, relativ standardisiertes Feedback zur Arbeit mit dem Selbsthilfeprogramm, sowie das Beantworten von Fragen. Diese Form der Unterstützung dient vor allem der Motivation der

Teilnehmenden, sich an die Vorgaben des Selbsthilfeprogramms zu halten und wird deshalb auch als *adhärenzfokussierte Anleitung* bezeichnet. Zeitlich und inhaltlich intensivere therapeutische Kontakte werden bisher vor allem in Ansätzen realisiert, die viele Schreibaufgaben beinhalten: Auf die von Klienten geschriebenen Texte, erfolgt hier in der Regel eine relativ ausführliche und individualisierte Antwort [3].

<Box Fallbeispiel>

Fallbeispiel Angeleitete Selbsthilfe

Christian G. ist ein 27-jähriger Student der Wirtschaftswissenschaften. Schon in der Schulzeit war er in sozialen Situationen sehr unsicher und hatte Schwierigkeiten Referate zu halten. Heute geht er so wenig wie möglich an die Uni, fürchtet sich vor Fragen und Blicken seiner Mitstudierenden und vor negativer Bewertung der Dozierenden. Für den Abschluss des Studiums fehlen ihm noch Seminare, in denen er ein Referat halten muss und die er seit zwei Jahren vor sich herschiebt. Jetzt droht ihm die Exmatrikulation. Herr G. weiss, dass er Hilfe braucht, er kann sich aber nicht überwinden, eine Therapie aufzusuchen. Schliesslich meldet er sich Online zu einer internetbasierten angeleiteten Selbsthilfeintervention an. Nach einer telefonisch durchgeführten Abklärung der Symptomatik beginnt Herr G. mit der Arbeit mit einem Selbsthilfeprogramm gegen verschiedene Angststörungen [2]. Er formuliert Ziele, beginnt mit dem Ausfüllen eines Protokolls zu schwierigen sozialen Situationen, lernt das kognitive Modell sozialer Ängste kennen und erarbeitet ein eigenes Erklärungsmodell seiner Ängste. In einem geschützten Nachrichtenbereich erhält er einmal in der Woche ein kurzes motivierendes Feedback von einer Therapeutin, die Zugang zu den Einträgen von Herrn G. hat. Die Therapeutin gibt ihm Feedback zu den Einträgen in den Online Tagebüchern, macht ihm Mut, beantwortet Fragen und erklärt kurz, welche Aufgaben als Nächstes auf ihn warten. Schrittweise arbeitet Herr G. ein Selbsthilfemodul nach dem anderen durch (siehe **Tab. 1**) und macht Fortschritte. Auf dem Weg zur Uni schaut er auf sein Smartphone und liest noch einmal, was er am Vorabend auf seinem Laptop in das Selbsthilfeprogramm geschrieben hat: "Ich werde mich morgen im Seminar mindestens zwei Mal melden", hat er sich vorgenommen. Und: "Sätze nicht vorher im Kopf ausformulieren, einfach mal drauflosreden und den Blickkontakt mit den anderen Studierenden und der Dozentin halten". Er liest noch einmal die aufmunternden Worte, die ihm die Therapeutin gestern in der geschützten Selbsthilfeumgebung geschrieben hat. Im Verlauf der Therapie schafft Herr G. es, öfter an die

Uni zu gehen, Kontakt zu Mitstudierenden aufzubauen und schliesslich auch zwei Referate zu halten.

<Ende Box Fallbeispiel>

2.1.3. E-Mail, Chat- und Video-Therapien

Neben ungeleiteten und angeleiteten Selbsthilfeprogrammen existieren auch reine Kommunikationsanwendungen wie E-Mail-, Chat- und Video-Therapien (z.B. Psychotherapie via Skype). Diese Online Therapien werden auf Distanz, aber persönlich erbracht (siehe **Abb. 1**) und können deshalb stärker als relativ standardisierte Selbsthilfeprogramme an individuelle Charakteristiken und Bedürfnisse der Patientinnen und Patienten angepasst werden. E-Mail, Chat- und Video-Therapien wurden bisher verhältnismäßig wenig erforscht. Sie sind stärker als Selbsthilfeansätze aus der Therapiepraxis entstanden, indem Therapeutinnen und Therapeuten mit der technischen Entwicklung Schritt gehalten und trotz Datenschutzbedenken angefangen haben, mit ihren Klienten zumindest teilweise via E-Mail, Chat oder Video zu kommunizieren.

2.1.2. Blended Psychotherapien

Immer häufiger werden auch sog. *Blended Psychotherapien* realisiert. Unter Blended Psychotherapie wird jegliche Art der Kombination von Vor-Ort-Psychotherapie mit Internet Interventionen wie Selbsthilfeprogrammen, Smartphone-Apps oder E-Mail-, Chat- oder Videokontakten verstanden. Ein deutschsprachiger Begriff hat sich bisher nicht etabliert – könnte aber *verzahnte Psychotherapie* sein [4]. Die Verzahnung kann dabei auf unterschiedliche Weise erfolgen [5]. So können Internet Intervention vor oder nach konventioneller Vor-Ort-Therapie eingesetzt werden, zum Beispiel als Wartezeitüberbrückung oder Nachsorge- und Rückfallpräventionsmaßnahme. Internet Interventionen können aber auch gleichzeitig resp. parallel mit der Vor-Ort-Psychotherapie eingesetzt werden, wobei der Schwerpunkt eher auf den Vor-Ort-Sitzungen oder den Internet Interventionen liegen kann. Das jeweils ergänzende andere Format wird üblicherweise zur Vorbereitung, Vertiefung oder Wiederholung der therapeutischen Inhalte verwendet. Daneben werden spezifische Vorteile der beiden Behandlungsformate genutzt, also beispielsweise der

Alltagstransfer neuer Verhaltens- und Denkweisen mit Online Hausaufgaben gefördert und individuelle Themen in den Face-to-Face-Sitzungen vertieft bearbeitet.

2.2. Vor- und Nachteile der verschiedenen Interventionsformate

Die verschiedenen Interventionsformate weisen jeweils unterschiedliche Vor- und Nachteile auf. So haben *ungeleitete Selbsthilfeprogramme* und *Apps* einerseits eine hohe Reichweite, weil sie leicht verfügbar und zu geringen Kosten unbegrenzt vervielfältigbar sind. Andererseits können leicht auch unseriöse Programme mit zweifelhafter Professionalität verbreitet werden (siehe Infobox *Die zwei Welten der Apps*). In Angeboten wiederum, die einen persönlichen Kontakt beinhalten, kann die Patientensicherheit besser gewährleistet werden. *Angeleitete Selbsthilfeansätze* und *Blended Psychotherapien* haben aber eine geringere Reichweite als ungeleitete Programme, weil Therapeutinnen und Therapeuten verfügbar sein müssen und Therapien im *Blended Format* auch teils vor Ort stattfinden. E-Mail-, Chat- und Video-Therapien wiederum haben den Vorteil, dass die Psychotherapie zu Hause stattfinden kann, und damit Menschen erreicht werden, die aufgrund zeitlicher und örtlicher Flexibilität keinen Therapieplatz finden. Gerade E-Mail-Therapien, in welchen keine zeitliche Struktur vorgegeben wird, können jedoch mit grossem Arbeitsaufwand für die Therapeutinnen und Therapeuten verbunden sein, weil das Lesen und Schreiben von langen E-Mails sogar länger dauern kann als das Sprechen in herkömmlichen Therapien [6].

Neben den erwähnten Fragen zur Professionalität der Anbieter und der Patientensicherheit gehören Fragen bezüglich Datensicherheit zu den grössten Herausforderungen von Internet Interventionen. Die in den letzten Jahren von verschiedenen Verbänden ausgearbeiteten Qualitätskriterien bei Internet Interventionen beziehen sich denn auch auf den adäquaten Umfang mit diesen Herausforderungen (siehe Infobox Umgang mit den wichtigsten Risiken von Internet Interventionen)

<Infobox>

Umgang mit den wichtigsten Risiken von Internet Interventionen

Identität und Qualifikation der Anbieter: Über das Internet können leicht Angebote mit zweifelhafter Professionalität verbreitet werden. Deshalb sollte bei seriösen Angeboten unmittelbar ersichtlich sein, wer die angebotene Dienstleistung erbringt, welche Qualifikation

der Anbieter mitbringt, was genau das Angebot und die Kosten des Angebotes sind, und in welcher Zeitspanne Ratsuchende mit einer Antwort von einer Fachperson rechnen können.

Vertraulichkeit und Datenschutz: Fragen zur Datensicherheit im Internet sind brennend aktuell und sollten bei Interventionen über das Internet oberste Priorität haben. Therapeutinnen und Therapeuten sollten deshalb höchste Standards der Verschlüsselung der Datenübermittlung und -speicherung einhalten und Patientinnen und Patienten über Risiken, Art, Umfang und Dauer der Datenspeicherung informieren.

Grenzen und Kontraindikation: Im Zentrum aller Indikationsüberlegungen steht die Patientensicherheit. Es besteht weitgehend Konsens darüber, dass sich internetbasierte Interventionen aufgrund der physischen Distanz und der oft zeitverzögerten Kommunikation nicht eignen, um angemessen auf akute, insbesondere suizidale Krisensituationen zu reagieren. In seriösen Angeboten werden Hilfesuchende deshalb schon auf der Homepage über diese Einschränkung informiert und es wird auf Notfallnummern hingewiesen. Bei vollständig via Internet durchgeführten Interventionen ist es üblich, zu Beginn einen individuellen Notfallplan zu erarbeiten, in welchem definiert ist, an wen sich Patientinnen und Patienten vor Ort wenden können, wenn sie während der Behandlung in eine Krise geraten.

<Ende Infobox>

<Infobox>

Die zwei Welten der Apps

Inzwischen lassen sich in App-Stores und auf dem Internet viele Programme finden, die der Selbst-Therapie psychischer Probleme dienen sollen. Die meisten der oft zu geringen Kosten

in Google Play und iTunes verfügbaren Apps sind nicht evidenzbasiert und viele sind inhaltlich von geringer Qualität. In einer kürzlich publizierten Übersichtsarbeit zu deutschsprachigen Apps zur Anwendung bei Depressionen wurde festgestellt, dass für keine einzige der 38 identifizierten, in App-Stores verfügbaren Apps eine Wirksamkeitsstudie vorliegt [7]. Die im vorliegenden Artikel beschriebenen Einschätzungen und Studien zu Selbsthilfeprogrammen, die in der akademischen Welt entwickelt und erforscht wurden, lassen sich also nicht auf die Welt der in App-Stores verfügbaren Programme übertragen.

<Ende Infobox>

2.3. Verändern Internet Interventionen therapeutische Ansätze?

Eine interessante Perspektive ergibt sich aus der Frage, in welcher Weise und in welchem Ausmass die verschiedenen Internet Interventionen konventionelle Therapieansätze auch inhaltlich bereichern und verändern. Wie erwähnt basieren die meisten der bisher erforschten Internet Interventionen auf kognitiv-verhaltenstherapeutischen Ansätzen. In vielen Internet Interventionen werden also Kenntnisse und Fertigkeiten vermittelt, die aus der herkömmlichen Psychotherapie im persönlichen Kontakt bekannt und gut erforscht sind, die Inhalte werden aber durch ein Computerprogramm und/oder auf Distanz vermittelt. Die Technologie ersetzt hier Therapeutinnen und Therapeuten (*Selbsthilfeprogramme*) oder die Erfordernis sich vor Ort in eine Therapiepraxis zu begeben (*E-Mail-, Chat-, Videotherapie*), inhaltlich findet aber im Vergleich zur konventionellen Therapie wenig Veränderung statt. Auch mit *Blended Psychotherapien* werden keine neuen therapeutischen Ansätze realisiert, sie können aber insofern zu einer Erweiterung und ggf. Verbesserung konventioneller Psychotherapien beitragen, als dass beispielsweise der Alltagstransfer neuer Verhaltens- und Denkweisen mit Online Hausaufgaben gefördert wird. **Tab. 2** ordnet verschiedene Internet Interventionen im sog. *SAMR-Modell* digitaler Transformation ein, welches in vier Stufen verdeutlicht, in welcher Weise und in welchem Ausmass neue Technologien bisherige Ansätze ersetzen (*Substitution*), erweitern (*Augmentation*), verändern (*Modification*) oder neu definieren (*Redefinition*; [8]). Während also die meisten der bisherigen Internet Interventionen konventionelle Psychotherapie 1:1 nachahmen und ersetzen (*Substitution*) bzw. höchstens im Rahmen von *Blended Psychotherapien* erweitern (*Augmentation*), ist damit zu rechnen, dass mit den neuen Technologien in Zukunft vermehrt neue Therapieansätze entwickelt werden. Ein Beispiel für eine Intervention, die eine Neugestaltung therapeutischer Aufgaben beinhaltet (*Modification*), sind *Serious Games*. In Serious Games, wie dem in Neuseeland entwickelten interaktiven Phantasiespiele SPARX (https://sparx.org.nz), werden Therapieinhalte in Form von Computerspielen vermittelt. In SPARX müssen Jugendliche eine Reihe von Herausforderungen bewältigen und lernen dabei kognitiv-verhaltenstherapeutische Konzepte anzuwenden und einzuüben. In einer randomisierten kontrollierten Studie, in welcher SPARX mit wöchentlicher psychologischer Beratung und Therapie verglichen wurde, konnten Depressionen und Ängste ebenso wirksam reduziert werden, wie mit traditioneller Beratung und Therapie [9]. Beispiele für neuartige Aufgaben, die in der konventionellen Psychotherapie nicht realisiert werden können (*Redefinition*), sind Programme zur Cognitive

Bias Modification (CBM) und Interventionen in der virtuellen Realität. CBM-Interventionen zielen darauf ab, verzerrte Aufmerksamkeits- oder Interpretationsprozesse, die an der Entstehung und Aufrechterhaltung verschiedener Störungen beteiligt sind, mittels repetitiver, computerbasierter Trainings zu korrigieren [6]. Mit Interventionen in der virtuellen Realität, die inzwischen auch via Internet vermittelt werden, können zur Angstbehandlung Expositionen realisiert werden, die in der Realität nicht oder nur mit grossem logistischen und finanziellem Aufwand realisiert werden können (z.B. Konfrontation von Kriegs-Veteranen mit Kriegssituationen). Weitere neuere Entwicklungen werden im nächsten Abschnitt ausgeführt.

Tab. 2 SAMR-Modell Digitaler Transformation mit Beispielen von Internet Interventionen

Transformations-schritt	**Erklärung**	**Beispiel Internet Interventionen**
Substitution (Ersetzung)	Technologie wird als Ersatz eingesetzt, ohne inhaltliche Änderung	Viele (angeleitete) Selbsthilfeprogramme, E-Mail-, Chat- und Videotherapien
Augmentation (Erweiterung)	Technologie erweitert/verbessert bisherigen Ansatz	Blended Psychotherapien (z.B. Alltagstransfer neuer Verhaltens- und Denkweisen wird mit Online Hausaufgaben gefördert)
Modification (Änderung)	Technologie ermöglicht Neugestaltung von Aufgaben	Serious Games (Therapieinhalte werden in Form von Computerspielen vermittelt)
Redefinition (Neudefinition)	Technologie ermöglicht das Erzeugen neuartiger Aufgaben, zuvor unvorstellbar	Cognitive Bias Modification Programme oder Interventionen in der virtuellen Realität

2.4. Neuere Entwicklungen

Verschiedene neuere Entwicklungen könnten in naher Zukunft mehr und mehr Anwendung in der psychosozialen Versorgung finden. Ein Beispiel für solche Entwicklungen sind die Integration von **Chatbot-Anwendungen** in Internet Interventionen. Chatbots sind eine Art Software-Roboter, welche als textbasiertes Dialogsystem funktionieren. Einer der bekanntesten Chatbots zur Zeit ist wohl Siri auf Apple Smartphones. Weiter entwickelte Chatbots können beispielsweise auch Nutzerprofile erarbeiten, um Antworten noch mehr auf eine bestimmte Person zuzuschneiden. Zudem können Chatbots lernfähig sein und stellen somit eine Art von künstlicher Intelligenz (*'artificial intelligence'*) dar. Dank Methoden wie

maschinellem Lernen (‘*machine learning’*) können Antworten mit der Zeit immer besser auf ein Gegenüber angepasst werden. Bei sehr gut entwickelten Chatbots kann es in Zukunft vielleicht schwierig werden zu erkennen, dass es sich beim Kommunikationspartner nicht um einen Menschen handelt. Eine 2017 erschienene Studie [10] lieferte erste Hinweise darauf, dass junge Menschen mit einer Depression mehr von KVT-abgeleiteten Selbsthilfeintervention in einem Gesprächsformat mit einem textbasierten Konversationsagenten (*‘conversational agent’*) profitierten als von einem Selbsthilfebuch mit ähnlichem Inhalt. Zudem sind zukünftig beispielsweise Entwicklungen denkbar, dass mittels maschinellem Lernen auf der Grundlage von Therapieeingangsdaten von Patienten (z.B. Geschlecht, Alter, Diagnosen, Therapieziele, etc.) automatisch diejenigen internet-basierten Module zu einer Intervention zusammengestellt werden, welche sich bei Patienten mit ähnlichem Profil in der Vergangenheit als am hilfreichsten erwiesen haben.

Des Weiteren werden mehr und mehr die Integration von sensor-basierten Daten in die psychosoziale Versorgung untersucht. Dies könnte beispielsweise beinhalten, dass eine Person die unter rezidivierenden Depressionen leidet während einer Internet Intervention auf der Grundlage der automatischen Aufzeichnungen ihrer Bewegungsdaten und/oder ihrer Aufenthaltsorte während der letzten sieben Tage ein Feedback erhält, dass sie sich wieder vermehrt angenehmen Aktivitäten widmen soll. Andere Einsatzmöglichkeiten liegen beispielsweise auch darin, verfolgen zu können, ob und wo ein Patient Expositionen zwischen zwei Sitzungen in vivo durchgeführt hat. Trotz unzähliger möglicher Einsatzbereiche kommt eine kürzlich publizierte Übersichtsarbeit zum Schluss, dass Daten, die von Mobiltelefonen und tragbaren Sensoren (z.B. Aktimetern) stammen, erst sehr begrenzt erforscht werden, um therapeutische Internet Interventionen bei psychiatrischen Störungen oder psychiatrischen Symptomen zu unterstützen [11]. Dies ist der Fall, obwohl es doch vermehrt Hinweise dafür gibt, dass sensor-basierte Daten mit psychopathologischen Symptomen zusammenhängen und bespielweise zur depressiven Rückfallprophylaxe benutzt werden könnten.

Während Virtual Reality weiter oben schon erwähnt wurde, so scheint uns hier auch der Verweis auf Augmented Reality (*deutsch*: erweiterte Realität) wichtig. Augmented Reality ist eine Technik, welche die nahtlose Verschmelzung von virtuellen und realen Komponenten des Lebens ermöglicht. Ein durch die starke mediale Verbreitung bekanntes Beispiel für solche Anwendungen ist beispielsweise das Smartphone-Spiel «Pokémon Go», bei welchem virtuelle Wesen durch das Aufsuchen von bestimmten Orten in der Realität eingesammelt werden müssen. Augmented Reality wurde im therapeutischen Setting

beispielsweise schon bei Spinnen-Phobie-Therapien erprobt. Es ist jedoch denkbar, dass mit der Verbesserung und der zunehmenden Verbreitung der dafür nötigen technischen Hilfsmittel sich auch andere Anwendungsgebiete herauskristallisieren werden. Vorstellbar wäre beispielsweise, dass man sich einen Therapeuten virtuell in die eigenen Wohnung holen kann, der einem bei der Durchführung von Expositionen unterstützen kann.

Die Erforschung vieler solcher Techniken steckt noch in den Kinderschuhen und es wird sich noch herausstellen müssen, ob es sich um reine Spielereien handelt oder sie für einen sinnvollen Einsatz in der psychosozialen Versorgung geeignet sind. Nicht zuletzt werfen solche neuen Entwicklungen auch viele verschiedene ethische Fragen auf, die es noch zu beantworten gilt, bevor sie erforscht und eingesetzt werden können.

3. Empirische Evidenz

Obwohl die Forschung zu internetbasierten Interventionen noch verhältnismässig jung ist, liegen schon über 200 kontrollierte Wirksamkeitsstudien vor. Die Studien decken ein breites Spektrum an psychischen und verhaltensmedizinischen Störungen und Problemen ab. Am häufigsten wurden angeleitete Selbsthilfeprogramme bei Angststörungen und Depression evaluiert [12].

3.1. Empirische Evidenz zu angeleiteten und ungeleiteten Selbsthilfeprogrammen

Ungeleitete und angeleitete Selbsthilfeprogramme sind die am häufigsten erforschten Internet Interventionen. **Tab. 3** gibt einen Überblick über Problem- und Störungsbereiche, für welche in randomisierten kontrollierten Studien eine Wirkung nachgewiesen werden konnte. Mehrere systematische Reviews und Metaanalysen über diese Studien zeigen, dass angeleitete Selbsthilfeansätze wirksamer sind als ungeleitete [13]. Während Selbsthilfeprogramme ohne Begleitung zwar statistisch signifikante, aber im Schnitt nur kleine bis mittlere Effekte erzielen, werden für angeleitete Selbsthilfeprogramme im Schnitt mittlere bis grosse Effekte gefunden, die mit der Wirkung herkömmlicher Therapien vergleichbar sind. Diese Annahme einer Wirkäquivalenz von angeleiteten Selbsthilfeprogrammen und herkömmlichen Psychotherapien wird bisher durch Studien mit direkten Vergleichen der beiden Bedingungen gestützt [12].

Merke: Dem therapeutischen Kontakt kommt auch in Internet Interventionen eine wichtige Bedeutung zu.

Zu den vorliegenden Studien muss allerdings erwähnt werden, dass häufig *selbstselegierte Stichproben* untersucht wurden, d.h. die Studienteilnehmer wurden oft über Zeitungsannoncen und -artikel oder Internetforen rekrutiert und haben sich gezielt und aus eigener Initiative für die Teilnahme an einer entsprechenden Intervention entschieden. Sie waren damit möglicherweise besonders motiviert und geeignet für den internetbasierten Ansatz.

Merke: In bisherigen Studien zu Internet Interventionen wurden meist selbstselegierte Stichproben untersucht. Es stellt sich deshalb die Frage, ob die vielversprechenden Ergebnisse auch auf Patientinnen und Patienten in der Routinepraxis generalisiert werden können.

Die Wirkunterschiede zwischen ungeleiteten und angeleiteten Selbsthilfeansätzen können zu einem Teil durch unterschiedliche Adhärenz- und Abbrecherraten erklärt werden: Ungeleitete Programme werden weniger genutzt und häufiger abgebrochen als angeleitete Programme [13]. Es wird vermutet, dass sich Betroffene bei ungeleiteten Interventionen weniger einer Person oder Institution verpflichtet fühlen, was zu einer geringeren Adhärenz und zu höheren Dropout-Raten führt. Für diese Hypothese sprechen auch Befunde, dass bei Selbsthilfeangeboten, die in einem professionellen und persönlichen Kontext vermittelt werden (z.B. durch Hausärzte; nach einer diagnostischen Abklärung durch eine Fachperson), geringere Abbrecherquoten und höhere Effekte gefunden werden als bei Angeboten, die ohne vorherige Abklärung genutzt werden [6].

Tab. 3 Bereiche, in welchen die Wirkung von internetbasierten Selbsthilfeprogrammen empirisch gezeigt wurde (adaptiert nach [12])

Psychiatrische Störungen	**Somatische Störungen/ Gesundheitsprobleme**	**Andere**
Depression (inkl. postpartale Depression) Bipolare Störung Panikstörung mit/ohne Agoraphobie	Kopfschmerzen Tinnitus Diabetes Schlafstörungen	Paartherapie Elterntraining Stressbewältigungstraining Perfektionismus

Soziale Angststörung Spezifische Phobie Generalisierte Angststörungen Hypochondrische Störungen Angst und Depression gemischt Zwangsstörung Posttraumatische Belastungsstörung Pathologisches Glücksspiel Verschiedene Essstörungen Körperdysmorphe Störung Verschiedene Substanzstörungen Aufmerksamkeitsdefizit-/Hyperaktivitätsstörung	Chronische Schmerzen Reizdarmsyndrom Begleitend bei Krebserkrankungen Enkopresis Erektionsstörung Chronisches Erschöpfungssyndrom Multiple Sklerose Übergewicht Rauchen	Selbst-Mitgefühl Burnout Prokrastination Komplizierte Trauer Körper-Unzufriedenheit Unerfüllter Kinderwunsch

Infobox: Merkmale wirksamer Internet Interventionen

Die Frage, für welche Patienten Internet Interventionen besonders erfolgsversprechend sind (und für welche nicht), lässt sich noch nicht fundiert beantworten. Die häufig geäusserte Annahme, dass das neue Behandlungsformat besser bei jüngeren, gut gebildeten oder computeraffinen männlichen Patienten wirkt, konnte in der Forschung nicht bestätigt werden. Auch wenn noch nicht klar ist, bei wem und wie Internet Interventionen wirken, lassen sich zumindest drei Merkmale nennen, die den wirksamsten Interventionen gemeinsam sind [6]:

1. die wirksamsten Internet Interventionen beinhalten einen ausführlichen Abklärungsprozess inklusive einem diagnostischen Interview, welches telefonisch oder von Angesicht zu Angesicht durchgeführt wird
2. in den wirksamsten Internet Interventionen werden Patienten während der selbständigen Bearbeitung von Selbsthilfematerialien von Therapeuten oder Coaches begleitet, die mindestens eine zeitliche Struktur schaffen (z.B. jede Woche eine Nachricht) und Patienten für die selbständige Arbeit motivieren
3. in wirksamen Interventionen werden in mehreren umfassenden Modulen oder Lektionen Inhalte und Übungen vermittelt, die auf evidenzbasierten Therapieansätzen basieren.

3.2. Empirische Evidenz zu E-Mail-, Chat- und Video-Therapien

Im Gegensatz zu den oben erwähnten Selbsthilfeansätzen ist die Ergebnislage bei Chat-, Email- und Video-Therapien noch spärlich. Die bisherigen Ergebnisse deuten aber

darauf hin, dass das verwendete Medium bzw. Kommunikationsformat letztlich keinen Einfluss auf die Wirkung der Therapie hat, dass also Chat-, Email- und Video-Therapien genauso wirksam sein können wie Vor-Ort-Psychotherapien. Dafür sprechen zum Beispiel die Resultate einer randomisiert kontrollierten Studie zu einer strukturierten E-Mail-Therapie depressiver Patientinnen und Patienten, die mit herkömmlicher 8-wöchtiger Psychotherapie verglichen wurde [14]. Beide Bedingungen profitierten dabei gleichermaßen von der Therapie. Ein anderes Beispiel ist eine randomisierte kontrollierte Studie, in welcher in Großbritannien eine Chat-Therapie mit einer Treatment-As-Usual-Kontrollgruppe verglichen wurde [15]. Der Unterschied zwischen E-Mail und Chat liegt darin, dass in Chat-Therapien ähnlich einer herkömmlichen Therapie in Echtzeit kommuniziert wird, während in E-Mail-Therapien zeitversetzt (asynchron) kommuniziert werden kann. In der erwähnten Studie zeigte sich die Chat-Therapie der TAU-Bedingung als signifikant überlegen, was auch nach 8 Monaten noch der Fall war.

Infobox:Therapiebeziehung

Eine häufige Frage ist, ob in internetbasierten Ansätzen auch eine gute Therapiebeziehung aufgebaut werden kann, und ob dieser eine ähnliche Bedeutung zukommt wie in Face-to-Face-Therapien. In verschiedenen Studien wurde gefunden, dass unabhängig des Kommunikationsmediums gemäß Patienteneinschätzung im Schnitt eine mit Face-to-Face-Ansätzen vergleichbar gute therapeutische Beziehung zustande kommen kann [16]. Eine neuere Metaanalyse zeigt außerdem, dass die Therapiebeziehung in Internet Interventionen etwa gleich stark mit dem Behandlungsergebnis zusammenhängt wie in Face-to-Face Therapien [17].

3.3. Empirische Evidenz zu Blended Therapien

Mit Blended Psychotherapien kann das Ziel verfolgt werden, die Wirkung von Psychotherapie zu verbessern, indem zusätzlich zur herkömmlichen Psychotherapie Internet Interventionen vermittelt werden. Erste Studien, in welchen herkömmliche Psychotherapie mit herkömmlicher Psychotherapie plus einem Selbsthilfeprogramm bei depressiven Patienten verglichen wurden, zeigten in der ambulanten und stationären Routinebehandlung eine Überlegenheit der Bedingung mit der zusätzlichen Internet Intervention [18]. Besonders in Kombinationsformaten, die eine enge Verzahnung von Face-to-Face- und Online-Behandlungskomponenten vorsehen, können Internet Interventionen Vor-Ort-Sitzungen auch ersetzen, und damit den Aufwand der Therapeutinnen und Therapeuten reduzieren. In ersten

Studien, die dieses Ziel verfolgten, konnte der Einsatz von Programmen die Zahl der Face-to-Face Sitzungen ohne Wirkungsverlust reduzieren [19].

Merke: Blended Therapien nutzen idealerweise die jeweiligen Vorteile der beiden Behandlungsformate. Erste Studienergebnisse bezüglich Wirkung und Kosten-Effektivität zu diesem Therapieformat sind vielversprechend.

3.4 Relevanz der verschiedenen Internet Interventionen

Abb. 2 verortet die oben dargestellten Internet Interventionen auf zwei Dimensionen: (1) der Reichweite: damit ist die Anzahl Betroffener gemeint, die mit einer Intervention erreicht werden können, und (2) der bisherigen Ergebnisse zur Wirksamkeit im Vergleich zu konventionellen Therapien. Interventionen, die sowohl eine hohe Reichweite, als auch Wirksamkeit versprechen, haben das grösste Potential, Prävalenz- und Inzidenzraten psychischer Störungen in der Bevölkerung zu reduzieren. Wie aus **Abb. 2** ersichtlich, geht eine hohe Reichweite auf Kosten der Wirksamkeit: Mit automatisierten Selbsthilfeprogrammen können zwar sehr viele Menschen erreicht werden, sie sind aber auch im Durchschnitt weniger wirksam als herkömmliche Psychotherapie. Solche Selbsthilfeprogramme sind damit wohl besonders im Public Health und Präventionsbereich interessant. *Blended therapies* wiederum haben keine so hohe Reichweite wie Selbsthilfeinterventionen. Mit der Kombination der beiden Formate kann aber möglicherweise die Wirkung einer Psychotherapie verbessert werden (**Abb. 2**).

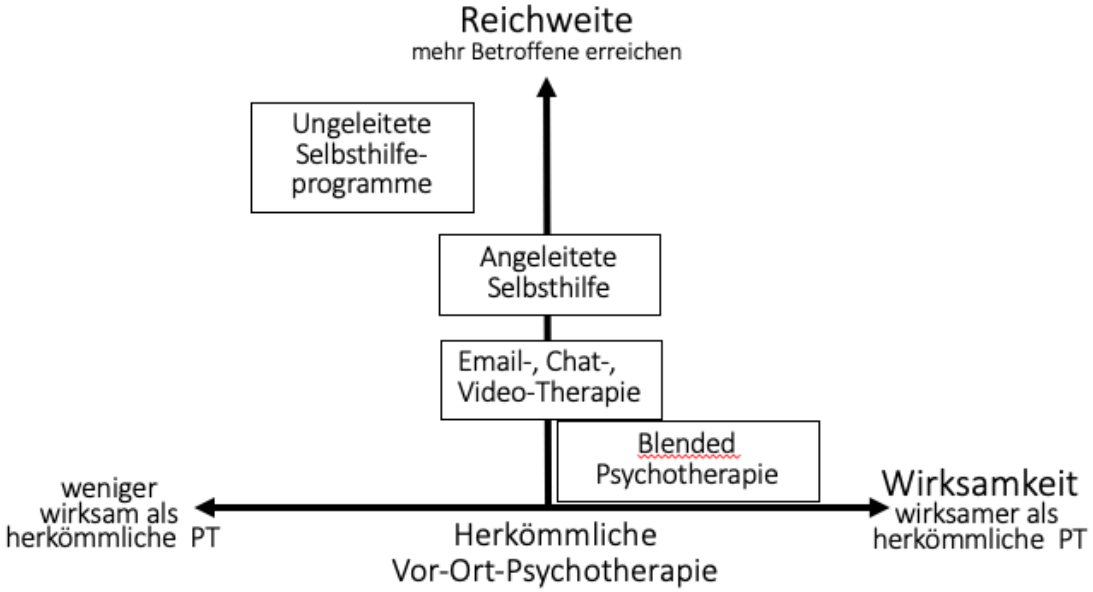

Abb. 2 Verortung der verschiedenen Internet Interventionen bezüglich Reichweite und Wirksamkeit (PT = Psychotherapie; adaptiert nach [1])

Merke: Die leichte Verfügbarkeit und hohe Reichweite stark automatisierter Interventionen geht in der Regel auf Kosten der Wirksamkeit.

4. Stand der Implementierung in die Routinepraxis

Ein Problem mit Internet Interventionen ist, dass sie zwar gut erforscht, aber – zumindest in deutschsprachigen Ländern – noch nicht in die Routinepraxis implementiert sind. Therapeutinnen und Therapeuten können also nicht einfach loslegen und die in Studien zu *blended treatments* erforschten Tools mit ihren Patientinnen und Patienten nutzen. Die für Betroffene entwickelten, empirisch validierten Selbsthilfeprogramme wiederum können für Selbstzahler teuer sein und werden von Krankenkassen bisher höchstens für die jeweils eigenen Versicherten bezahlt.

Andere Länder sind weiter In bestimmten Ländern wie Schweden oder Australien sind Internet Interventionen schon sehr viel stärker in die Routinepraxis implementiert, weil die zuvor an Universitäten entwickelten und evaluierten Programme in Kliniken transferiert und von dort aus den Bürgerinnen und Bürgern zur Verfügung gestellt wurden. Beispiele für solche staatlich unterstützten bzw. vom Gesundheitssystem bezahlten virtuellen Kliniken sind die Mindspot Klinik in Australien (https://mindspot.org.au) oder die Internet Psychiatry Unit am Karolinska Institut in Schweden (http://web.internetpsykiatri.se/en).

Forschung in Routinepraxis Da der Kontext, in welchem eine Internet Intervention vermittelt wird, eine wichtige Rolle spielt, sollte jede Intervention auch im jeweiligen Implementierungskontext getestet werden. Inzwischen zeigen einige Studien, dass Internet Interventionen auch in der Routinepraxis funktionieren können [12], jedoch gibt es auch Ausnahmen. Ein aktuelles Beispiel, in welchem eine etablierte und gut erforschte Intervention nicht genutzt wurde und auch nicht wirksam war, ist eine in Deutschland durchgeführte Studie, in welcher depressive Patientinnen und Patienten während der Wartezeit auf einen Psychotherapieplatz Zugang zu einem Selbsthilfeprogramm erhielten [20].

Merke: Ein Problem mit Internet Interventionen ist, dass sie zwar gut erforscht, aber – zumindest in deutschsprachigen Ländern – noch nicht in die Routinepraxis implementiert sind.

Kernaussagen (5-10 Kernaussagen am Ende des Beitrages)

- Die verschiedenen internetbasierten Interventionsformate lassen sich auf den Dimensionen *automatisiert versus persönlich* und *auf Distanz versus vor Ort* erbracht einordnen. Während ungeleitete Selbsthilfeprogramme vollständig automatisiert und auf Distanz vermittelt werden, erfolgen in anderen Interventionen zusätzliche persönliche Kontakte auf Distanz (*angeleitete Selbsthilfeansätze*) oder Psychotherapiesitzungen vor Ort (*Blended Psychotherapien*).
- Zu den wichtigsten Herausforderungen bei Internet Interventionen gehört die Sicherung der Qualifikation der Anbieter und Inhalte, der Vertraulichkeit der Daten und der Patientensicherheit.
- *Ungeleitete* und *angeleitete Selbsthilfeprogramme* sind die am häufigsten erforschten Internet Interventionen. Während angeleitete Selbsthilfeprogramme ähnlich wirksam sind wie Vor-Ort-Psychotherapien, sind ungeleitete Selbsthilfeprogramme oft mit hohen Abbrecherraten und kleineren Effekten verbunden.
- Via Internet kann eine gute Therapiebeziehung aufgebaut werden. Wie in der konventionellen Psychotherapie hängt in Internet Interventionen die Qualität der Therapiebeziehung mit dem Therapieerfolg zusammen.
- Für die psychotherapeutische Routinepraxis besonders vielversprechend sind *Blended Therapien*. Diese Kombinationsformate sind ein Beispiel dafür, wie Internet Interventionen herkömmliche Psychotherapien nicht ersetzen, aber sinnvoll ergänzen können.
- Ein Problem mit Internet Interventionen ist, dass sie zwar gut erforscht, aber – zumindest in deutschsprachigen Ländern – noch nicht in die Routinepraxis implementiert sind.

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Interessenkonflikte

Die Autoren geben an, dass keine Interessenkonflikte vorliegen.

Appendix B: Article II

Optimizing the Context of Support to Improve Outcomes of Internet-Based Self-help in Individuals With Depressive Symptoms: Protocol for a Randomized Factorial Trial.

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Optimizing the Context of Support to Improve Outcomes of Internet-Based Self-help in Individuals With Depressive Symptoms: Protocol for a Randomized Factorial Trial

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Abstract

Background: Internet-based self-help interventions for individuals with depressive symptoms, in which the main component is often a web-based self-help program, have been shown to be efficacious in many controlled trials. However, there are also trials on self-help programs showing no significant effect when delivered in routine care, and some studies report high dropout and low adherence rates. Research suggests that these findings do not emerge primarily due to the specific content of a self-help program. It seems more important how a program is embedded in the context of human and automated support before and during the use of a self-help program.

Objective: This study aims to better understand the effects of 4 supportive contextual factors on outcomes of and adherence to a web-based self-help program for depressive symptoms. In a factorial experiment, 2 of 4 supportive factors, for which there is evidence for their role on outcomes and adherence, are realized during the intervention—personal guidance and automated email reminders. The other 2 factors are realized before the intervention—a diagnostic interview and a preintervention module aimed at increasing the motivation to use the program with motivational interviewing techniques.

Methods: The study is a full factorial randomized trial. Adults with mild to moderate depressive symptoms (Patient Health Questionnaire–9 score: 5-14) are recruited from the community through the internet and conventional media. All participants receive access to a web-based self-help program based on problem-solving therapy. They are randomized across 4 experimental factors, each reflecting the presence versus absence of a supportive factor (guidance, automated reminders, diagnostic interview, preintervention module) resulting in a 16-condition balanced factorial design. The primary outcome is depressive symptoms at 10 weeks post assessment. Secondary outcomes include adherence to the program, anxiety, stress, health-related quality of life, possible negative effects, and treatment satisfaction.

Potential moderators and mediators (eg, treatment expectancy, problem-solving skills, working alliance with the study team) will also be investigated.

Results: Ethical approval was received on January 20, 2020. The study was initiated in February 2020, and 240 participants have been enrolled in the study as of November 1, 2020. Recruitment for a total of 255 participants is ongoing. Data collection is expected to be completed by May 2021.

Conclusions: A better understanding of relevant supportive factors in the dissemination of web-based interventions is necessary to improve outcomes of and adherence to web-based self-help programs. This study may inform health care systems and guide decisions to optimize the implementation context of web-based self-help programs for depressive symptoms.

Keywords:

Depression, self-help, adherence, internet-based intervention, factorial design, problem-solving therapy, mental health, multiphase optimization strategy, digital health

The study was preregistered at ClinicalTrials.gov (NCT04318236).

Introduction

Depression is one of the most common mental disorders that burdens society and individuals psychologically and financially [1,2]. Psychological consequences of depression include lower quality of life and more years lived with disability [3,4]. Although psychotherapy is an established evidence-based treatment option for depression [5], people often do not receive adequate care [6-8]. Internet-based self-help interventions are promising to reduce the burden of depression. During the last two decades, several research groups intensively studied the efficacy of internet-based self-help interventions and concluded that they effectively reduce depression [9-12].

Internet-based self-help interventions complement existing interventions in health care, addressing some of their limitations. Potential advantages of internet-based self-help interventions include that they are easily accessible, provide a high degree of anonymity, can be used independently of time and place, and can be provided to many people simultaneously. Hence, many authors suggest internet-based self-help interventions as a possibility to complement face-to-face psychotherapy to improve mental health care [13].

Although internet-based self-help interventions effectively reduce depressive symptoms, their potential might not be fully exploited. For example, studies [10] about internet-based self-help interventions for depression report a wide range of effect sizes (Hedges g=0.02-1.56). One study [14] that investigated widely used internet-based self-help interventions for depression failed to transfer the established effects into other settings, such as primary care. Further challenges of internet-based self-help interventions are low uptake rates (ie, logging into an intervention) and low levels of adherence (eg, completing modules of an intervention) [15,16].

One reason for diverging outcomes and adherence seems to be the degree of human support and guidance provided before and during the use of a self-help program. Current

literature suggests that unguided internet interventions without human support at any stage tend to be associated with high dropout rates [17], lower adherence [18], and lower effects [11]. In a review [19], the authors suggested there were positive effects from guidance during the treatment on outcome in depressive patients. Additionally, several meta-analyses [9,12,21,22] report larger symptom reductions in guided self-help interventions with therapist support during the treatment compared to unguided self-help interventions without therapist support during the treatment. However, the differences between guided and unguided interventions may also be related to other factors such as the scope of diagnostic assessments or the length and content of a self-help program. These and other factors may confound the association between guidance, adherence, and outcomes. It is worth mentioning that in some studies [23,24] directly comparing self-help interventions with and without guidance, no significant differences were reported about the outcomes and number of modules completed.

In the review [19], the authors propose that other forms of human interaction (such as pretreatment contact) might also be beneficial for the treatment with internet-based self-help interventions. In a study [20] with patients suffering from social anxiety disorder, a diagnostic telephone interview conducted before an internet-based intervention significantly improved adherence to treatment and secondary outcomes of depression and stress.

Other aspects that potentially improve internet-based self-help intervention outcomes and adherence can be automated and realized without human contact. There is limited evidence that automated email reminders may improve adherence and outcomes of internet interventions. For example, a study [25] that compared semistandardized email feedback with fully standardized email feedback did not find a difference in the 2 conditions indicating that fully automated emails may be as effective as semistandardized feedback. Furthermore, in a transdiagnostic intervention, email reminders resulted in better outcomes for participants who had elevated co-occurring symptoms of anxiety and depression [26]. However, this did not

apply to participants with elevated symptoms of either just anxiety or depression. In the same study [26], the reminders increased the number of people completing the intervention. Consistent with this finding, some participants mentioned that they experience email reminders helpful for adhering to the intervention [27].

Another possibility for increasing outcomes of and adherence to internet-based self-help interventions is to enhance the motivation of participants. A well-known method in face-to-face treatments to address ambivalence and enhance motivation is motivational interviewing [28]. High effect sizes and increased adherence were observed in a study [29] with motivational interviewing prior face-to-face psychotherapy treatment. A study [30] on an internet-based self-help intervention for social phobia was able to replicate these findings for internet-based self-help interventions to some extent—whereas participants of the group that received an additional motivational interviewing–based intervention did not show a higher magnitude of improvement, these participants were more likely to complete the treatment. Furthermore, for patients with depressive symptoms, a brief informational video about internet-based self-help interventions significantly increased the acceptance of internet-based self-help interventions [31].

Thus, several supportive contextual factors have been associated with better outcomes and increased adherence. Yet, it is not entirely clear which factors are crucial for a significant enhancement of internet-based self-help interventions. Consequently, clear guidelines for how to optimally embed internet-based self-help interventions into a context of supportive factors are missing. To fully exploit the potential of internet-based self-help interventions, dismantling studies are needed to understand how and which supportive factors are essential when disseminating internet-based self-help interventions. Often, studies that investigated the influence of a specific supportive factor such as guidance had other factors in their study design that potentially confounded the effect of guidance (eg, a diagnostic interview).

Therefore, only conclusions about the whole treatment package (eg, internet-based self-help intervention, diagnostic interview, and guidance combined) and not about individual supportive factors (eg, either diagnostic interview or guidance) were possible. This entanglement limits insight into both the main effect of a given factor and possible interactions with other factors.

One reason for limited insight into essential supportive factors may be reliance upon RCTs in internet-based self-help intervention research. Although RCTs are the gold standard for establishing the efficacy or effectiveness of an intervention, they are not suited for investigating the effects of single supportive factors or specific treatment components. Because RCTs only compare the whole multifactorial intervention (treatment package) with another intervention or a control group, specific mechanisms are confounded with one another. Therefore, it is only possible to draw conclusions about the whole treatment package and not about the main and interactive effects of specific factors [32].

A new approach to getting more insight into how treatments work is the multiphase optimization strategy, which integrates perspectives, approaches, and concepts of various sciences [33]. Collins and Kugler [33] suggest that behavioral intervention research has focused too much on establishing the efficacy of treatments rather than understanding how treatments work and how they could be optimized. The multiphase optimization strategy's fundamental idea is to optimize interventions to meet specific criteria such as effectiveness, economy, or scalability. Interventions can be optimized by making decisions based on findings about which intervention components work and which intervention components do not work, which ones work well together, or which ones adversely affect each other.

The multiphase optimization strategy presents several experimental designs to optimize interventions. The most frequently used in behavioral sciences is the factorial design [34-36]. This design allows investigating multiple factors simultaneously within one trial. It can reveal

which factors are active or inactive in influencing the desired outcomes. More specifically, factorial experiments allow exploring the main effects of and possible interactions between factors. Consequently, the findings of a factorial design study are suited to optimize a given intervention because they provide information about which factors can be kept and which factors can be omitted. Note that Collins and Kugler [33] do not claim that RCTs can be replaced with factorial designs. Rather, they suggest an integrative strategy that focuses both on optimizing interventions (for which there are better designs than RCTs) and establishing efficacy or superiority of interventions (for which RCTs are still the best option).

This study aims to further clarify the optimal context of support of internet-based self-help interventions for depressive symptoms. It uses a factorial design to test the impact of 4 factors and their combinations. These factors are (1) a diagnostic interview conducted before the intervention, (2) a preintervention module using techniques of motivational interviewing accessible before the intervention, (3) human guidance during the intervention, and (4) automated email reminders during the intervention.

Methods

Study Design

The study, including assessments and the self-help intervention, will be conducted online. Participants will not receive any financial reimbursement for taking part in the study. The study consists of a full factorial trial that includes 4 experimental factors. Each factor will be evaluated at 2 levels (either present or absent), resulting in a 16-condition (2×2×2×2) balanced full factorial design (Table 1). Factorial designs allow for reliably estimating all main effects and 2-factor interactions. To do so, the full sample (ie, participants from all 16 conditions) are used. Thereby, power remains associated with all participants as half of the participants are in a condition with a specific factor active, and half of the participants are in a

condition with a specific factor inactive. This makes the factorial design efficient with respect to sample size and power.

Participant Eligibility

Eligible participants are German-speaking residents of Switzerland, Germany, Austria, and Lichtenstein. Inclusion criteria are (1) being at least 18 years of age; (2) meeting criteria for mild to moderate depression (score between 5 to 14 on the Patient Health Questionnaire–9) [37]; (3) providing written informed consent; (4) having access to the internet as well as an email account; and (5) providing an emergency contact before treatment. The study allows participants to take part even if they currently receive constant antidepressant medication or psychotherapy treatment. Exclusion criteria are (1) having a history of a psychotic or a bipolar disorder and (2) having increased suicidal tendencies (a score >7 on the Suicide Behaviors Questionnaire-Revised)[38,39].

Study Procedure

Interested participants can leave an email address on our study website [40]. Participants will automatically receive study information and an informed consent sheet (by email). After providing informed consent, participants are invited to complete the baseline assessment. Study eligibility is assessed and if included in the study, participants must wait 2 weeks before they can start with the intervention. Depending on which condition participants are randomized to, during these 2 weeks, participants either wait, are diagnostically interviewed, receive access to the preintervention motivational interviewing module, or receive both the interview and the preintervention motivational interviewing module (see Table 2).

If individuals are excluded, they can make use of the intervention outside of the study. However, participants reporting suicidal ideation first need to confirm that they are in touch

with their emergency contact or a psychotherapist. We offer to provide a contact for professional psychological help in case participants are severely depressed.

Recruitment

Participants are recruited through depression-related websites, radio interviews, self-help groups, Facebook groups, Google ads, and the website of the University of Bern (Switzerland). The description of our study includes a link to the study website. Written informed consent to participate in the study is obtained from all participants.

Intervention

The web-based self-help program *Herausforderungen meistern (overcoming challenges)* (HERMES) is based on problem-solving therapy [41]. The first, second, and last author developed the online program at the University of Bern. The problem-solving therapy intervention includes an introductory module and 3 toolkits: (1) Feeling, (2) Thinking, and (3) Acting. Problem-solving therapy shares various assumptions of cognitive behavioral therapy but focuses more explicitly on problems causing distress and problem-solving skills. We recommend that participants use the intervention approximately 1 hour per week and complete each module or toolkit within 2 weeks. This results in 8 weeks of recommended program use. An online problem-solving therapy intervention has previously been investigated in a 3-arm RCT [42]. Results indicated that, compared to a waiting list control group, the online problem-solving therapy intervention was as effective as an online cognitive behavioral therapy intervention in reducing symptoms of anxiety and depression [42].

Within the factorial design, 4 factors are realized. The first factor consists of a diagnostic telephone interview conducted before the self-help program. The second factor is a preintervention module based on motivational interviewing presented before the self-help program. The module aims at initiating a reflection process about one's motivation for using

the intervention [29]. The third factor is human support during the self-help program with personalized weekly emails. Guidance contains answering questions from participants within 3 working days and giving regular feedback on progress once a week. It is carried out by trained Master and PhD students who are supervised by licensed psychotherapists. The fourth factor is a set of weekly automatically sent emails during the self-help program. The emails inform participants on how far they should be in the program approximately, suggest content to work on next, and remind participants that they take part in a study. In contrast to human support (guidance), these emails are not individualized and contain the same information for all participants. In addition to these emails, prompts are sent to participants who have not logged in for 1 week. Our research focuses on investigating the context of human and automated support when providing web-based interventions. This implies that all participants receive the same main intervention with all program components of HERMES and that the main intervention is not changed throughout the whole study.

Study Outcome Measures

All outcome measures will be assessed online with validated German versions of the original questionnaires.

Primary Outcome Measure

Symptoms of depression will be assessed with the self-reported measure Patient Health Questionnaire–9 [37]. The Patient Health Questionnaire–9 has good diagnostic validity, sensitivity, and specificity and is a commonly used measure to assess and monitor depression severity [43].

Secondary Outcome Measures

Adherence is defined as the extent to which participants use the intervention. Following the suggestion of Donkin et al [44], a composite score encompassing time spent in

the intervention, number of modules completed, number of exercises completed, number of log-ins, and number of clicks in the intervention will be used to measure adherence to the intervention. The composite score will be created by averaging the *z* scores of these indicators. Furthermore, and for exploratory purposes, we will also run the analyses with each of these indicators of adherence. Symptoms of anxiety will be assessed with the Generalized Anxiety Disorder–7 [45]. Symptoms of stress will be assessed with the stress subscale of the Patient Health Questionnaire [45]. Health-related quality of life will be assessed with the Short Form Health Survey–12 [46,47]. Suicidal ideation will be assessed with the Suicide Behaviors Questionnaire–Revised [48,49]. Problem solving will be assessed with the Social Problem Solving Inventory-Revised [50,51].

Treatment Characteristics

Possible adverse effects of the intervention will be assessed with the Inventory for the Assessment of Negative Effects of Psychotherapy [52]. Client satisfaction will be measured with the Client Satisfaction Questionnaire [53,54]. System usability will be assessed with the System Usability Scale [55,56].

Moderators and Mediators

Demographic information about participants will be assessed at baseline. Treatment expectancy will be assessed with the Credibility/Expectancy Questionnaire [57]. Working alliance with the online coaches will be assessed with the Working Alliance Inventory for Guided Internet Interventions [58].

Randomization

The online platform Qualtrics (Qualtrics XM) randomizes participants in 2 steps. First, after T0 and before any contact with the study team, participants are randomized automatically to 1 of 4 groups (1, diagnostic interview and motivational interviewing module;

2, diagnostic interview; 3, motivational interviewing module; 4, no factor). The first randomization is stratified (either mild or moderate depressive symptoms). Second, after 2 weeks and completing T1, participants are randomized to 1 of 4 groups (1, guidance and email reminders; 2, guidance; 3, email reminders; 4, no factor). Both times, block randomization ensures a balance in sample size across groups over time. A schedule of enrollment and participation is shown in Table 2.

Data Collection, Management, and Analysis

Participants complete questionnaires at all 5 time points online via Qualtrics. We manually invite participants to complete the baseline questionnaire (T0). The 4 subsequent time points (after 2, 4, 10, and 16 weeks) are automatically triggered once T0 is completed. We try to limit the amount of missing data from survey attrition by reminding participants after 5 and 10 days to complete the questionnaires.

Statistical Analysis

Statistical reporting will follow CONSORT [59] and CONSORT-EHEALTH standards [60]. We will conduct primary analyses using intention-to-treat. The primary outcome is the change in Patient Health Questionnaire–9 score from baseline to 10 weeks and 16 weeks. Dropout rates are examined per condition. Before the analysis, we will examine baseline predictors of attrition. If it appears that attrition is related to measured aspects of the participants, we will include those measures as covariates in the models.

To test for the main and interaction effects of treatment components on primary and secondary outcomes, linear mixed model analysis of variance will be used. This approach uses all available data on each subject and does not involve the substitution of missing values but estimates parameters about missing values. However, sensitivity analyses will explore the impact of the imputation of missing values before computing the mixed models. The main

effects and interactions will be based on aggregates across experimental conditions. The purpose of the factorial experiment is not to compare the 16 conditions to each other but to estimate the main effects of the 4 factors and interactions between the factors. For example, the main effect of the diagnostic interview will be estimated by comparing the mean of the experimental conditions in which this factor is present (conditions 1-8 in Table 1) versus the mean of the experimental conditions in which this factor is not present (conditions 9-16 in Table 1). No adjustment for multiple testing will be applied in the estimation of statistical significance because, in the optimization phase of the multiphase optimization strategy framework, the emphasis is on deciding what components will make up the optimized intervention [33]. Only a future RCT can then establish the superiority of the optimized intervention over other conditions.

Power Analysis

We conducted an a priori power analysis for small-to-medium effect sizes (Cohen *d*=.35) for main effects and interactions between 2 factors (eg, guidance and diagnostic interview) on change in depressive symptoms (G-Power 3.1). From a clinical perspective, smaller effects are considered to be less relevant [61]. For type I error α=.05, with a common power of .80 to detect effects. Based on previous studies, we assume that our measurements regarding pre, post, and follow-up correlate at approximately *r*=.60. For a factorial design, this signifies a sample of n=204 to detect effects. Because we expect a dropout rate of about 20%, the planned sample size is n=255. For every condition, roughly 15 participants are required.

Results

The study was registered at ClinicalTrials.gov (NCT04318236). The ethics committee of the canton of Bern (*Kantonale Ethikkommission Bern*) approved the study on January 20, 2020 (2019-01795). Recruitment started in February 2020. As of November 1, 2020, out of

1480 interested individuals, 409 individuals have completed T0, and 240 participants have been enrolled in the study.

Discussion

Overview

The primary outcome is depressive symptoms 10 weeks after baseline. Several secondary outcomes will be measured, such as symptoms of anxiety and stress, health-related quality of life, suicidal ideation, and problem solving. Possible moderating (age, gender, and adherence) and mediating (treatment expectancy, therapeutic alliance) effects will be tested. Furthermore, negative effects of psychotherapy, treatment satisfaction, system usability, and dropout rates will also be measured and inspected. This study builds on a wealth of encouraging efficacy studies of internet-based self-help. It promises to provide a more detailed insight into which supportive context factors enhance outcomes of and adherence to internet-based self-help interventions for depressive symptoms. Furthermore, the study may also inform about possible mediation and moderation effects that could provide more information about how or why internet-based self-help interventions for depressive symptoms work.

Strengths and Limitations

Our study has been designed to shed more light on the supportive context of internet-based self-help interventions. It deconstructs a treatment package and explores active and inactive supportive factors. Understanding which factors do and do not work will help us get closer to the goal of delivering internet-based self-help interventions optimally. According to the guidelines of multiphase optimization strategy, a future RCT should test an intervention providing an optimal supportive context based on our findings, against an intervention providing a context that is usual in studies about internet-based self-help interventions (eg, an

intervention with guidance). With such a study, the possible superiority of the optimized context could be established.

Limitations of this study are comparable to those of the majority of studies about internet-based self-help interventions. The sample of this study is self-selected and participants become aware of our study through the internet. This limits the generalizability of possible findings to regular clinical settings or individuals that rarely use the internet.

Conclusion

To improve outcomes to future internet-based self-help interventions for depression, this study could provide recommendations on how to optimize the context of human and automated support. Based on findings of active and inactive factors and the interactions thereof, recommendations could be made for future research and the implementation and dissemination of internet-based self-help interventions in routine care.

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Authors' Contribution

OTB and TB designed the study. OTB is responsible for the data collection. OTB wrote the first version of the manuscript. TK, SM, JPK, and TB read the manuscript and provided suggestions for improvements. All authors approved the final version of the manuscript.

Conflicts of Interest

JPK received funding for clinical trials (German Federal Ministry of Health, Servier), payments for presentations on internet interventions (Servier), payments for workshops and books (Beltz, Elsevier, Hogrefe, and Springer) on psychotherapy for chronic depression and on psychiatric emergencies.

Abbreviations

CONSORT: Consolidated Standards of Reporting Trials

CONSORT-EHEALTH: Consolidated Standards of Reporting Trials of Electronic and Mobile Health Applications and Online Telehealth

HERMES: *Herausforderungen meistern (overcoming challenges)*

RCT: randomized controlled trial

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Appendix of Article II: A

Table 1. Overview of the 16 experimental conditions of the full factorial design—every factor is balanced; therefore, each is present (+) and absent (–) an equal number of times.

Condition	Diagnostic interview	Preintervention motivational interviewing module	Guidance	Email reminders
1	+	+	+	+
2	+	+	+	–
3	+	+	–	+
4	+	+	–	–
5	+	–	+	+
6	+	–	+	–
7	+	–	–	+
8	+	–	–	–
9	–	+	+	+
10	–	+	+	–
11	–	+	–	+
12	–	+	–	–
13	–	–	+	+
14	–	–	+	–
15	–	–	–	+
16	–	–	–	–

Table 2. Study flow and overview of study variables.

Study activity		Study period and timepoint					
		Allocation		Postallocation			Follow-up
		Week 0, T0	Week 0-2	Week 2, T1	Week 4, T2	Week 10, T3	Week 16, T4
Enrollment							
	Registration	✓	—[a]	—	—	—	—
	Informed consent	✓	—	—	—	—	—
	Eligibility screening	✓	—	—	—	—	—
	Randomization	✓	—	✓	—	—	—
Treatment							
	Internet intervention	—	—	✓	✓	✓	✓
Factors							
	Diagnostic interview	—	(✓)[b]	—	—	—	—
	Motivational interviewing module	—	(✓)	—	—	—	—
	Guidance	—	—	(✓)	(✓)	(✓)	—
	Automated emails	—	—	(✓)	(✓)	(✓)	—
Surveys							
	Patient Health Questionnaire–9[c]	✓	—	✓	✓	✓	✓
	Generalized Anxiety Disorder–7	✓	—	—	—	✓	✓
	Patient Health Questionnaire–Stress	✓	—	—	—	✓	✓
	Short Form health survey–12	✓	—	—	—	✓	✓
	Suicide Behaviors Questionnaire–Revised	✓	—	—	—	✓	✓
	Social Problem-Solving Inventory–Revised	✓	—	—	—	✓	✓
	Client Satisfaction Questionnaire	—	—	—	—	✓	—
	Working Alliance Inventory for Guided Internet Interventions	—	—	—	✓	✓	—
	Credibility/Expectancy Questionnaire	✓	—	✓	✓	—	—
	Inventory for the Assessment of Negative Effects of Psychotherapy	—	—	—	—	✓	✓
	System Usability Scale	—	—	—	—	✓	—

[a]The study activity was not applied at this point.
[b]Parentheses indicate that factors apply to half of the participants.
[c]Primary outcome.

Appendix C: Article III

Optimizing the Context of Support of Web-Based Self-Help in Individuals With Mild to Moderate Depressive Symptoms: A Randomized Full Factorial Trial

Bur, O. T., Krieger, T., Moritz, S., Klein, J. P. & Berger, T. (2022). Optimizing the context of support of web-based self-help in individuals with mild to moderate depressive symptoms: A randomized full factorial trial. *Behaviour Research and Therapy*, *152*, 104070. https://doi.org/10.1016/j.brat.2022.104070

Optimizing the Context of Support of Web-Based Self-Help in Individuals with Mild to Moderate Depressive Symptoms: A Randomized Full Factorial Trial

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Abstract

Web-based self-help programs for individuals with depressive symptoms are efficacious. Differences in effect sizes and adherence rates might be due to contextual factors. This randomized factorial trial investigated the effects of four potentially supportive contextual factors on outcome and adherence. Two factors were provided through human contact (guidance and a diagnostic interview), and two factors were provided without human contact (a motivational interviewing module and automated emails).

We recruited 316 adults with mild to moderate depressive symptoms (Patient Health Questionnaire–9 score: 5-14). All participants received access to a problem-solving therapy program. Participants were randomized across the four experimental factors (present or absent), resulting in a 16-condition design. The primary outcome was depressive symptoms 10 weeks after baseline. The secondary outcome was program adherence.

Overall, results showed significant symptom reduction for the primary depression measure (Cohen's $d = 0.38 – 0.91$). Guided participants showed significantly less severe symptoms of depression at post-treatment ($d = 0.15$) and higher treatment adherence ($d = 0.53$). At follow-up, these differences were no longer present. The remaining three factors did not influence primary outcome and adherence.

These findings indicate that guidance leads to a faster reduction of depressive symptoms and higher treatment adherence.

Keywords: Web-based self-help program, internet intervention, depression, factorial trial, problem-solving therapy, adherence

The study was preregistered at ClinicalTrials.gov (NCT04318236).

Introduction

Depression causes an enormous psychological and financial burden for individuals and society as a whole (Tanner et al., 2019; Üstün et al., 2004). The internet is increasingly used to provide self-help programs and increase the reach of treatments (Andersson et al., 2019). These programs reduce depressive symptoms effectively and could add to existing mental health care (Carlbring et al., 2018; Karyotaki et al., 2021).

Although web-based self-help programs are efficacious, their potential is not fully exploited. For example, not all studies found superiority of web-based programs over control groups (e.g., Gilbody et al., 2015), and effect sizes in studies about self-guided programs differ widely (Hedges' *g*= -0.13-0.89; Karyotaki et al. 2017). Furthermore, some users barely engage in the programs or never login in the first place (Eysenbach, 2005; Gilbody et al., 2015).

A significant reason for differing outcomes and adherence seems to be human support during the use of a self-help program (i.e., guidance). Across several meta-analyses, guided participants reported larger reductions in depressive symptoms than unguided participants (Andersson & Cuijpers, 2009; Baumeister et al., 2014; Karyotaki et al., 2021; Richards & Richardson, 2012; Spek et al., 2007). Furthermore, guided participants were more likely to stay in treatment and adhere to the program recommendations (Christensen et al., 2009; Melville et al., 2010). However, most studies included in the meta-analyses did not investigate the effect of guidance with direct comparisons. Instead, they either compared guided or unguided programs with a control group. Therefore, the associations of guidance, adherence, and outcomes could be confounded or influenced by other factors, such as diagnostic assessments, automated emails, or specific self-help programs. Such factors might explain why studies with direct comparisons did not find significantly larger effects in favor of guided

versus unguided treatment conditions (Berger et al., 2011; Berger et al., 2011). Of note, the effect of guidance seems to be only short-term (Karyotaki et al., 2021).

It has been suggested that other forms of human contact in a treatment process or a study, such as a contact with a professional in a diagnostic assessment or the study team during the recruitment process, could benefit outcomes and adherence (Johansson & Andersson, 2012). In a web-based social anxiety program study, participants showed higher adherence and larger symptom improvement on secondary outcomes (i.e., depression and stress) if they had undergone a diagnostic telephone interview at pretreatment (Boettcher et al., 2012). As diagnostic assessments are often necessary for both research and routine care settings, it is worthwhile investigating whether the benefits of these assessments generalize to other mental health disorders.

Apart from human contact, other forms of support such as automated emails may also improve outcomes of and adherence to web-based self-help programs. For example, participants with elevated co-occurring symptoms of anxiety and depression reported larger symptom reductions when receiving supportive automated emails (Titov et al., 2013). Furthermore, there is evidence that automated emails (in the form of automated feedback) is as effective as semi-standardized feedback provided by coaches (i.e., guidance) (Zagorscak et al., 2018). Moreover, participants are less likely to drop out of treatment if they receive automated encouragement to continue treatment (Furukawa et al., 2021).

Another aspect that might improve outcomes of and adherence to a web-based program is to enhance participants' motivation to use the program. A well-known method to increase motivation is motivational interviewing (MI; Miller & Rollnick, 2012). MI addresses ambivalence and resistance towards treatment and has been associated with high treatment effects and increased adherence in face-to-face settings (Hettema et al., 2005; Miller & Rollnick, 2012). In the context of web-based self-help, MI seems to increase adherence as

well. Participants of a social anxiety study were more likely to complete the treatment if they received MI (Titov et al., 2010). Furthermore, participants of a transdiagnostic study spent more days in treatment when receiving MI (Soucy et al., 2021). Of note, MI did not improve symptomatic outcomes in either study.

To sum up, there is evidence that supportive contextual factors, such as human contact, diagnostic assessments, automated emails, or a motivational module before using a self-help program, might influence outcomes and adherence. However, it is unclear which of these contextual factors and which combinations enhance outcomes of web-based treatments. To exploit the full potential of web-based self-help programs, we need dismantling studies to understand which supportive factors enhance outcomes and adherence to web-based self-help programs.

As already mentioned, studies that investigated the influence of a specific supportive factor such as guidance had other factors in their study design that potentially confounded its effect (e.g., a diagnostic interview). Therefore, conclusions can be derived only for the whole treatment package (e.g., a web-based self-help program, a diagnostic interview, and guidance combined) and not about specific contextual factors (e.g., either diagnostic interview or guidance). This limits insight into both the main effect of a given factor and potential interactions with other factors. Furthermore, most of the available research on web-based programs focused on whether treatment as a whole is efficacious. For this, researchers predominantly used randomized controlled trials (RCTs) to compare a treatment group to a control group (Watkins & Newbold, 2020). While this approach is the gold standard to establish the efficacy of a treatment, it provides no insight into the extent to which individual treatment components contribute to overall treatment efficacy (ranging from negative effects to no effects to positive effects).

A factorial trial is a suitable method to understand potentially supportive contextual factors (Collins & Kugler, 2018). Factorial designs allow estimating the main effects of several factors simultaneously and therefore reveal which factors are active or inactive in influencing the desired outcome. Furthermore, they allow estimating the possible interactions between factors and reveal which factors do or do not work well together. In recent years, behavioral researchers have increasingly been using factorial designs. For example, Hadjistavropoulos et al. (2020) investigated whether homework reflection questionnaires or the frequency of therapist support influenced outcomes of a web-based program. Using a factorial design allowed the authors to conclude that neither factor affected the primary outcome and that the factors did not interact with each other. Furthermore, whereas homework reflection questionnaires were associated with fewer logins and days spent in the program, twice-weekly therapist support was associated with more emails sent to therapists.

With the present randomized full factorial trial, we aimed to clarify the optimal context of support of web-based self-help programs for depressive symptoms. By "context of support", we mean all possible additional interventions and supporting factors before and during the main intervention. In the present study, we investigated the effects of four potentially supportive contextual factors (1; guidance, 2; a diagnostic interview, 3; a motivational interviewing module, 4; automated emails) on outcomes and adherence. Furthermore, we looked at the interactions between these factors to see which combinations yield the most benefit for outcomes and adherence.

Methods

Participant recruitment

Between February 28, 2020, and February 13, 2021, we recruited 317 participants with mild to moderate depressive symptoms from Switzerland, Germany, and Austria through depression-related websites, radio interviews, self-help groups, Facebook groups, Google ads,

and the website of the University of Bern (Switzerland). Interested individuals registered on our study website (https://selfhelp.psy.unibe.ch/hermes/homepage). After completing and returning a consent form, participants completed the baseline online questionnaire (T0), which checked for eligibility. Inclusion criteria were 1) being at least 18 years of age, 2) indicating mild to moderate depressive symptoms on the Patient Health Questionnaire-9 (PHQ-9 score between 5-14), 3) providing written informed consent, 4) having access to the internet and an email account, and 5) providing an emergency contact. Exclusion criteria were 1) reporting a present or past psychotic or bipolar disorder, or 2) indicating increased suicidal tendencies on the Suicidal Behavior Questionnaire-Revised (SBQ-R > 7). Of note, participants taking medication or seeing a psychotherapist could take part in the study. Participants were not compensated for taking part in the study.

Participant characteristics are shown in Table 1. Participants of this study were on average 38.0 years of age (*SD* = 13.66, range: 19-78). Most participants were female (71.8%), single (62.3%) and Swiss (51.0%) or German (43.0%). Most participants reported university education (58.9%) and part- or full-time employment (59.5%). About one-third of the participants were in concurrent psychological treatment (29.8%), and about one-fifth used prescribed medication for mental disorders (20.3%) at baseline.

Study design

We used a randomized full factorial design with four experimental factors. Each factor was varied at two levels (either present, coded as +1, or absent, coded as -1; i.e., effect coded), which resulted in a 16-condition (2x2x2x2) trial. All factors are orthogonal to each other. For every factor, half the participants were in a condition with a given factor present, and half the participants were in a condition with a given factor absent. We estimated all main and 2-factor interaction effects with the whole sample. Therefore, the power to detect main or interaction effects was equally high, assuming that they have similar effect sizes (Collins & Kugler,

2018). The nature of the study did not allow for the blinding of coaches or participants to the various factors. Our study protocol describes the study in more detail (Bur et al., 2021). The ethics committee of the canton of Bern (Kantonale Ethikkommission Bern) approved the study on January 20, 2020 (2019-01795), and we preregistered the study at ClinicalTrials.gov (NCT04318236).

Randomization

After completing baseline questionnaires and being included in the study, the online survey software Qualtrics (Qualtrics XM) randomized participants to 1 of 4 groups (1, diagnostic interview; 2, motivational interviewing; 3, diagnostic interview and motivational interviewing, or 4, neither of these two factors). This randomization was stratified for mild (PHQ-9: 5-9) or moderate (PHQ-9: 10-14) depressive symptoms. Two weeks after completing the baseline questionnaire (T1), Qualtrics again randomized participants to 1 of 4 groups (1, guidance; 2, automated emails; 3, guidance and automated emails; 4, neither of these two factors). At the same time, participants received access to the program *HERMES*. We included the two-week delay between baseline and T1-questionnaires because we wanted to provide participants enough time to engage in the diagnostic interview and the motivational interviewing module while keeping the time from randomization to the start of the treatment constant for all participants.

Block randomizations ensured equal distribution across the different groups. However, because of some dropouts before the second randomization, groups were not perfectly balanced. The randomization schemes were concealed from both the participants and the study staff. See Figure 1 for participant flow.

Power considerations

We conducted an a priori power analysis for small-to-medium effect sizes (Cohen's *d* = .35) for main effects and 2-way interactions (e.g., guidance and diagnostic interview) on

change in depressive symptoms (G-Power 3.1). From a clinical perspective, smaller effects are considered to be less relevant (Donker et al., 2009). For a type I error-level of $\alpha = .05$, a power of 80%, and an estimated dropout rate of 20%, the required sample size was $N = 255$. Because the dropout rate was higher than expected (34%), we continued to recruit up to 317 participants.

The self-help program

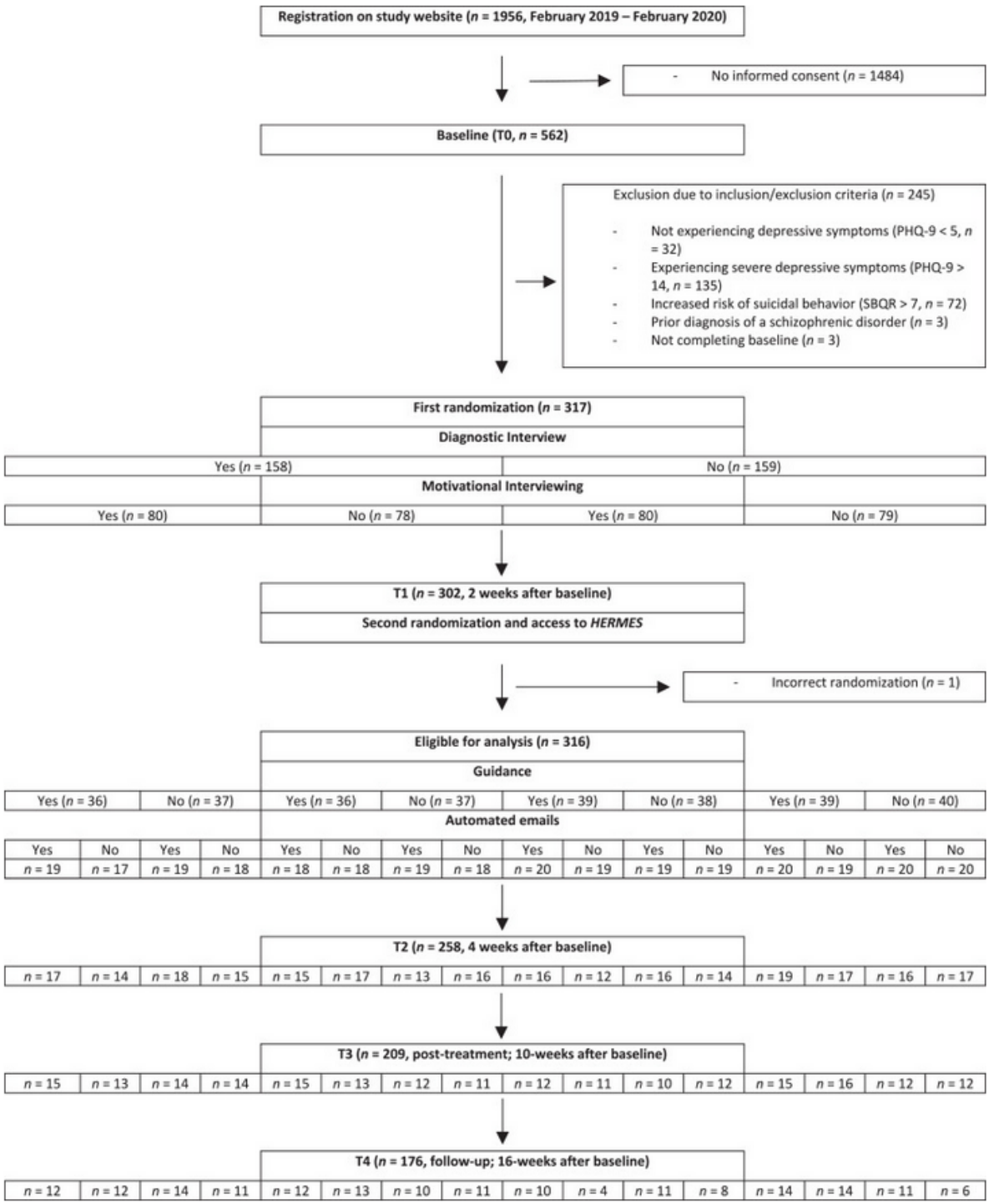
All eligible participants received full access to the 8-week self-help program *HERMES*. The program is based on problem-solving therapy (PST; Nezu et al., 2012) and was developed at the University of Bern. *HERMES* consists of an introduction and three toolkits. While the introduction presents the rationale of PST, the three toolkits are organized around the themes of feeling, thinking, and acting. Each toolkit consists of several topics. These topics include mindfulness, emotion regulation, observing emotions and relaxation (Toolkit 1: Feeling); self-criticism, cognitive restructuring, and healthy thinking (Toolkit 2: Thinking); as well as defining problems and goals, thinking of solutions, choosing a solution, acting out a solution plan, and evaluating problem-solving (Toolkit 3: Acting). The introduction and the toolkits include 1) case examples, 2) videos, audios, and text, and 3) several exercises. All exercises can be completed multiple times, and their content is stored in the program. Patients were recommended to use the program for 1 hour per week and complete each section (introduction or a toolkit) within two weeks.

Treatment conditions

Factor 1: Human Guidance (Guidance)

After the second randomization, e-coaches (supervised master students in their last term of a graduate program in clinical psychology and psychotherapy and a Ph.D. student in clinical psychology and psychotherapy) supported participants in the guided groups ($n = 150$) for 8

Figure 1. Participant flow from registration to 16-week follow-up



weeks. At the beginning of the treatment, the e-coach introduced her- or himself, explained that they would support the participant by email and that the participant could ask questions at any time. Each week, the e-coach wrote an email to the participant providing feedback on the

participants' behavior and progress in the self-help program. The messages were sent in a secured email system integrated into the program and did not include further therapeutic advice. The most important aspects of the feedback were crediting and reinforcing participants' independent work. If participants did not work with the program from one feedback to the next, the e-coaches asked if participants were facing any problems and offered their support. E-coaches answered questions within the next three days. In total, e-coaches sent 1,140 messages to the 139 participants who had logged in at least once (8.2 messages per participant). Furthermore, coaches spent 107 minutes per participant (*SD* = 62.8) and 12.6 minutes per message (*SD* = 6.5).

Factor 2: Diagnostic Interview (DI)

After the first randomization, we contacted participants of the DI groups (*n* = 157) to schedule the telephone appointment for conducting the Mini International Interview (M.I.N.I.; Sheehan et al., 1998). The DI lasted between 20 and 40 minutes.

Factor 3: Motivational Interviewing (MI)

After the first randomization, participants in MI groups (*n* = 159) received access to a module based on motivational interviewing (Miller & Rollnick, 2012) before the main program *HERMES*. This MI module starts with a video explaining that knowing one's motives to participate in the self-help program will keep the motivation up during the treatment. Then an exercise follows in which participants can reflect on why they want to change something and what they wish for in the future. Next, a video introduces an exercise where participants are asked to imagine a future where their problems are solved. In a subsequent exercise, participants are asked to write down how such a future could affect their lives, both if it came true and if it did not. Participants were asked to complete the module before the main program *HERMES.* On average, participants (*n* = 128) spent 0.48 hours on MI (*SD* = 0.41).

Factor 4: Automated Emails (AE)[1]

After the second randomization, participants in the AE groups (n = 154) received automated weekly emails for 8 weeks. The emails were written in a supportive tone, informed participants on how far they should be in the program, suggested content to work on next, and served as a reminder that participants take part in the treatment.

Study Outcome Measures

We assessed all outcomes online via Qualtrics with validated German versions of the original questionnaires. The primary outcome and various secondary outcomes were measured at baseline (T0), post-treatment (T3, 10 weeks after baseline), and follow-up (T4, 16 weeks after baseline). In addition, questionnaires were administered during treatment 2 weeks after baseline (T1) and 4 weeks after baseline (T2).

Primary Outcome Measure

Patient Health Questionnaire (PHQ-9). The primary outcome was the PHQ-9 at post-treatment (10-weeks after baseline). The PHQ-9 is a validated 9-item self-report measure of depressive symptoms with a range of 0 to 27 (Kroenke et al., 2001). Cronbach's α for post-intervention data ranged from .81 – .84. Since the PHQ-9 served as an inclusion criterion, baseline data were affected by substantial restriction of range and distorted reliability estimates (Stauffer & Mendoza, 2001).

Secondary Outcome Measure

Adherence. We defined adherence as the extent to which participants used the self-help program. Therefore, we calculated a composite score by averaging the z-scores of the following indicators: number of clicks, number of topics worked on, number of completed

[1] Note that the term differs from the study protocol of the present study (Bur et al., 2021). We changed the term "automated email reminders" to the more appropriate term "automated emails" based on feedback from a reviewer.

exercises, and time spent on the program. We calculated the overall adherence and the adherence during two time periods, i.e., from baseline to post-treatment and from post-treatment to follow-up.

Other Outcome Measures

Other outcomes included the Generalized Anxiety Disorder Questionnaire (GAD-7; Spitzer et al., 2006), the Patient Health Questionnaire – Stress (PHQ-Stress; Gräfe et al., 2004), the Short Form Health Survey – 12 (SF-12; Ware et al., 1996), the Suicide Behaviours Questionnaire – Revised (SBQ-R; Osman et al., 2001), the Problem Solving Inventory – Revised (SPSI-R; D'Zurilla et al., 2002), the Inventory for the Assessment of Negative Effects of Psychotherapy (INEP; Ladwig et al., 2014), the Client Satisfaction Questionnaire (CSQ-8; Schmidt & Wittmann, 2002); and the System Usability Scale (SUS; Brooke, 1996). The results of the Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) and the Working alliance Inventory for Guided Internet Interventions (WAI-I; Gómez Penedo et al., 2019) will be presented elsewhere. For a more detailed description of outcome measures, please see Appendix A.

Statistical Analyses

For baseline and demographic measures, we tested differences between groups with a factor vs. without a factor with *t*-tests for continuously distributed variables and χ^2-tests of independence for categorical variables. We evaluated different outcomes at post-treatment with linear mixed-models, which account for the non-independence of observations due to repeated measures. Time was a within-subject factor (pre-post), and the four factors were between-subject factors (each factor yes vs. no). The approach follows an intention-to-treat principle and uses all available data of each subject. For missing values, parameters are estimated and not imputed (Gueorguieva & Krystal, 2004). The mixed models were estimated through full information maximum likelihood. We used the best fitting covariance structure

for each model according to the Bayesian Information Criterion (BIC). We did not adjust for multiple testing in the estimation of statistical significance because, in factorial trials, the emphasis is on detecting the possibly relevant components that optimize a treatment (Collins & Kugler, 2018). In additional sensitivity analyses, we included age and problem-solving score as covariates in our mixed model analyses since there were baseline differences in these variables. However, the covariates had no influence on the results. Within- and between-group effect sizes were calculated based on the observed and estimated means. For adherence, we calculated *t*-tests for group differences and two-way ANOVA's for interactions between factors. To test if effects were maintained for follow-up measures, we used mixed models with time as a within-subject factor (post-follow-up) and the four factors as between-subject factors.

Results

Baseline evaluation

Baseline characteristics are shown in Table 1. There were no pre-treatment between-group differences for participant characteristics (*p*s > .08) with one exception: Participants with MI were older than participants without MI (t_{310} = -2.44, p = .02, d = 0.27). Furthermore, there were no pre-treatment between-group differences for primary or secondary outcomes (*p*s > .12) with one exception: Participants with a DI had a higher overall problem-solving score than participants without a DI (t_{313} = -2.68, p < .01, d = 0.30).

Dropouts from the study

Of the 316 participants, 66.1% completed post-treatment questionnaires and 55.7% completed follow-up questionnaires. Participants who failed to fill in post-treatment or follow-up questionnaires were considered dropouts for the respective time point. We found no between-group differences for post-treatment completion rates for three of the four factors (*p*s > .32) and for most demographic and outcome variables at baseline (*p*s > .17). However,

guided participants tended to be more likely to complete post-treatment questionnaires (χ^2_1 = 3.65, p = .06). Furthermore, older participants were more likely to complete post-treatment questionnaires (t_{238} = -2.33, p = .02). The same was the case for initially more severely depressed participants ($t_{209.2}$ = -2.20, p = .03) and for more adherent participants ($t_{298.7}$ = -15.04, p < .001). A similar pattern emerged for follow-up questionnaires. We found no between-group differences for follow-up completion rates for three of the four factors (ps > .09) and for most demographic and outcome variables at baseline (ps > .12). However, participants with a DI were more likely to complete follow-up questionnaires (χ^2_1 = 4.22, p = .04). Again, older participants were more likely to complete follow-up questionnaires (t_{314} = -3.89, p < .001). The same was the case for initially more severely depressed participants ($t_{209.2}$ = -2.15, p = .03) and more adherent participants ($t_{298.7}$ = -12.84, p < .001).

Treatment uptake and use

Treatment uptake was defined as having used the self-help program at least once. In sum, 271 (85.5%) took up treatment. χ^2-tests revealed no differences in treatment uptake for the DI, guidance, and AE. However, participants exposed to MI were less likely to take up treatment (χ^2_1 = 4.19, p = .04). On average, participants clicked 88 times (accessing a topic; *SD* = 105.0, range = 0-970), completed 16 exercises (*SD* = 16.9, range = 0-123), and spent 3.56 hours online (*SD* = 3.74, range = 0-16.67). Furthermore, participants worked on average on 13 topics (*SD* = 7.7, range = 0-21), with 206 (65.2%) having accessed at least half of the topics, 151 (47.8%) having accessed at least three-quarters of the topics, and 91 (28.8%) having accessed all topics. χ^2-tests revealed no differences in treatment completion for the MI and AE. However, participants with a DI (χ^2_1 = 4.24, p = .04), as well as participants with guidance (χ^2_1 = 7.34, p = .006) were more likely to complete treatment.

Primary Outcome

Observed (pre) and estimated (post) means, standard deviations, and Cohen's *d* effect sizes for the PHQ-9 are shown in Table 2. Overall, participants were less depressed at post-treatment ($F_{1, 194.6} = 60.82$, $p < .001$). Within-group effect sizes ranged from $d = 0.38 – 0.91$. Guided participants were less depressed post-treatment compared to unguided participants ($F_{1, 194.6} = 4.89$, $p = .028$, $d = 0.15$, Figure 2). Furthermore, participants with a DI showed a tendency to be more depressed at post-treatment compared to participants without a DI ($F_{1, 194.6} = 3.27$, $p = .072$, $d = -0.25$). Interestingly, the time by guidance and DI interaction was significant ($F_{1, 194.6} = 4.41$, $p = .037$, Figure 3). Post-hoc between group comparisons revealed that guided participants with a DI were less depressed at post-treatment compared to unguided participants with a DI ($t_{93.5} = 2.11$, $p = .038$, $d = 0.37$).

Secondary Outcome

T-tests revealed no differences in the overall composite adherence scores for the DI, the MI as well as the AE (*ps* > .11). However, guided participants adhered more to the program compared to unguided participants ($t_{260.9} = -4.66$, $p < .001$, $d = 0.53$). The difference between the two groups was significant from baseline to post-treatment ($t_{260.2} = -5.02$, $p < .001$, $d = 0.58$) but not from post-treatment to follow-up ($t_{295.8} = -1.12$, $p = .26$). No interaction between the factors was significant (two-way ANOVAs, *p*s > .20). The composite adherence score significantly correlated with the pre-to-post changes in PHQ-9 (Kendall's $\tau = 0.11$, $p = .025$).

Figure 2. Change in depressive symptoms with and without guidance.

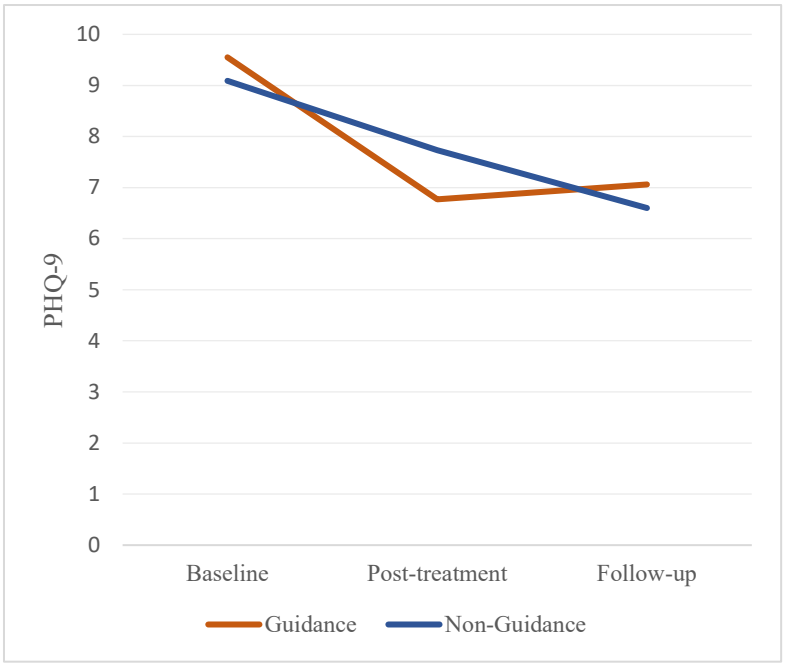
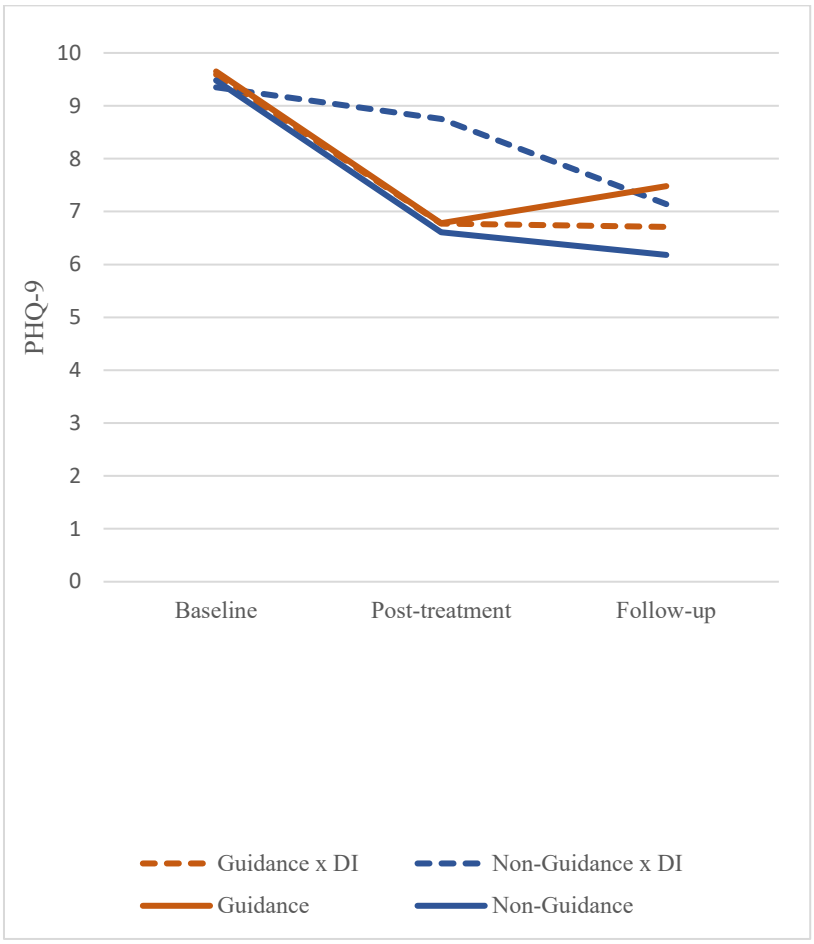


Figure 3. Change in depressive symptoms with or without guidance and with or without a diagnostic interview.



Other Outcomes

Observed (pre) and estimated (post) means, standard deviations, and Cohen's *d* effect sizes for other outcomes are shown the Appendix C (Table A.1). Overall, at post-treatment, participants were less anxious (*GAD-7;* $F_{1, 226.8} = 60.58$, $p < .001$, $d = 0.34 – 0.72$) and less stressed (*PHQ-Stress;* $F_{1, 219.3} = 27.95$, $p < .001$, $d = 0.23$ - 0.35). Furthermore, participants reported a higher quality of life (*SF-12 Mental Health;* $F_{1, 215.6} = 46.35$, $p < .001$, $d = 0.34$ - 0.58) and a higher problem-solving score (*SPSI-R;* $F_{1, 194.44} = 20.75$, $p < .001$, $d = 0.14 – 0.30$). Surprisingly, participants reported less physical well-being (*SF-12 Physical Health;* $F_{1, 226} = 15.06$, $p < .001$, $d = - 0.36 – 0.22$). For more details on results on other outcomes, please see Appendix B.

Follow-up

Observed means at follow-up and Cohen's *d* post-treatment to follow-up effect sizes for primary and secondary outcomes are shown in Table 2 and in the Appendix C (Table A.1). While the improvements of depression, anxiety and problem solving remained stable from post to follow-up ($F_{1, 157.3 - 171.2} = 1.79 – 3.10$, ps $> .07$, $d = -0.14 – 0.19$), symptoms of stress and quality of live continued to improve (PHQ-Stress: $F_{1, 167.4} = 8.18$, $p = .005$, $d = 0.03 – 0.31$; SF-12 Mental Health: $F_{1, 162.5} = 8.46$, $p = .004$, $d = 0.10 – 0.22$). Of note, the time by guidance interaction for depressive symptoms was significant ($F_{1, 171.2} = 5.55$, $p = .02$, $d = -0.09$). Post-hoc within-group comparisons revealed that unguided participants showed fewer depressive symptoms at follow-up ($t_{74} = 2.79$, $p = .007$). For guided participants, depressive symptoms remained stable ($t_{91} = -.83$, $p = .41$). Guided and unguided participants did not differ in their depressive symptom improvement at follow-up ($F_{1, 209.5} = 0.06$, $p = .081$, $d = -0.08$).

Negative effects of treatment

On average, participants reported 0.22 (range = 0-3, *SD* = 0.55) negative effects of treatment. The relative frequency for reporting a negative effect was 0.02. Out of 15 possible negative effects, nine were reported at least once. The most frequent items related to "feeling dependent from the study team" (*n* = 14, 6.8%), "having difficulties taking important decisions" (n = 12, 5.8%), and "being afraid others might find out about the treatment" (*n* = 12, 5.8%). The majority of participants completing post-treatment questionnaires (*n* = 156, 75.4%) did not report a negative effect. T-tests revealed no differences in the occurring negative effects for the DI, the MI, and the AE (*ps* > .51). However, guided participants reported more negative effects compared to unguided participants ($t_{259.9}$ = -2.11, *p* = .04). This difference emerged because more guided participants felt "dependent from the study team" than unguided participants did after the intervention (11 vs. 3, χ^2_1 = 4.91, *p* = .03).

Treatment Satisfaction and usability

Participants were mostly satisfied with the self-help program (CSQ-8; *Mean* = 3.05, *SD* = 0.55). T-tests revealed no between-group differences for treatment satisfaction for the DI and AE (*p*s > .82). However, whereas participants with guidance were more satisfied with the treatment (t_{205} = -2.3, *p* = .02, *d* = 0.32), participants with MI were less satisfied with the treatment (t_{202} = 2.33, *p* = .02, *d* = -0.33). Participants rated the usability of the program as excellent (SUS; *Mean* = 85.8, *SD* = 11.9). T-tests revealed no between-group differences for usability ratings for the four factors (*p*s > .22)

Discussion

This randomized full factorial trial explored the optimal context of support for web-based self-help programs for depressive symptoms. Therefore, we investigated four potentially supportive contextual factors (guidance, a diagnostic interview, motivational interviewing, and automated emails) that might improve outcomes and adherence to a web-based self-help program.

Guidance improved depressive symptoms at post-treatment and led to increased adherence compared to non-guidance. These results align with previous meta-analytical research, highlighting the importance of human support in web-based self-help (Richards & Richardson, 2012; Spek et al., 2007). However, our results add to the literature because guidance benefits were found in a direct comparison within the same study. In what way symptom change is facilitated by human support is not fully understood yet. It might be that the relationship of a participant to an online coach plays an important role. Indeed, there is evidence that the quality of the therapeutic relationship improves outcomes in online treatments (Probst et al., 2019). Another explanation is that guided participants feel more accountable when a coach is present and therefore engage more in the treatment (Mohr et al., 2011). Our results partially support this hypothesis since guidance led participants to spend more time in the program and work on more treatment content. However, having contact with a coach is not only advantageous because more guided than unguided participants felt dependent from the study team at post-treatment.

The effect of guidance seems to last only short-term. In line with a recent meta-analysis, at follow-up, unguided participants had benefited equally as guided participants (Karyotaki et al., 2021). More specifically, whereas unguided participants further improved from post-treatment to follow-up, guided participants remained stable. An obvious explanation for this would be that, after guidance ended at post-treatment, unguided participants used the program more frequently and therefore caught up in symptom improvement. However, since adherence scores did not differ from post-treatment to follow-up, our results do not support this hypothesis. Another explanation might be that guidance accelerates change but that unguided and guided participants equally benefit from the program in the long run. Although this may question the benefit of guidance, speeding up the reduction of symptoms is nevertheless an improvement of treatment, especially in light of the

depression burden. It is noteworthy that the overall symptom reduction was relatively small and that most participants were mildly depressed. Therefore, our results may not generalize for individuals with more severe depression.

Our study shows that guidance can also play an important role in combination with other factors such as a DI. Contrary to previous findings (Johansson & Andersson, 2012), participants with a DI only improved their symptoms to a significant extent when they were guided during the program afterward. As such, guidance seems to buffer the potentially negative impact of a DI. An explanation for this result is that interviewed participants might feel distressed during the exploration of their symptoms. If a DI remains the only contact, participants might feel left alone when continuing treatment. Conversely, participants might feel better cared for and benefit more from a self-help program when knowing that a coach continues to support them throughout the treatment. A DI alone had no significant effect on outcomes and adherence. Thus, the benefits of a DI in a social anxiety study (Boettcher et al., 2012) did not generalize to our depression study. However, diagnostic assessments can still be necessary for the delivery of web-based self-help programs. For instance, an initial contact might be crucial to match a patient's needs or evaluate whether it is safe to use a self-help program. When necessary, it seems advisable to combine a DI with guidance.

A MI module before the main self-help program did not improve outcomes. This result is in line with a recent study on a transdiagnostic intervention for anxiety and depression (Soucy et al., 2021). Soucy et al. (2021) argue that their participants were highly motivated and could thus not benefit from an extra motivational exercise. We speculate that this was the case for our self-selected sample, unfortunately; however, we did not assess motivation. Soucy et al. (2021) mention further that MI might even be counterproductive if participants are already highly motivated to work on their problems. In our study, two results speak in favor of this possibility. Participants with MI were less likely to take up treatment and were

less satisfied with the web-based program. One reason for the dissatisfaction might be that the MI module evoked unrealistically high expectations in some participants about to what extent the program could help participants change their lives. Consequently, the standardized content of the program might have disappointed such participants. This might be a specific weakness of online MI. In face-to-face MI, therapists could tailor interventions to a participant's needs and temper unrealistically high expectations. Concerning adherence, our results suggest no benefit either. This finding contrasts with other studies in which participants spent more time in the program or showed higher completion rates due to online MI (Soucy et al., 2021; Titov et al., 2010). So far, there is no convincing evidence for the benefit of online MI. Future studies should investigate whether online MI benefits specific subgroups, such as participants showing low motivation to change or participants resisting treatment (Hettema et al., 2005).

AE during the self-help program did not improve outcomes and adherence. The results suggest that simply reminding participants is not enough to gain additional benefits from treatment. The question arises why AE had positive effects in other studies. It could be that AE are useful for specific participants only, such as those with high comorbidities (Titov et al., 2013). However, another possibility is that AE are only supportive if they have specific functions. Comparing the AE of our study with those of Titov et al.'s study, one crucial difference is that the participants in their study also received AE when they had completed a lesson or had not started a lesson within a week. Therefore, it might be that the direct response to participants' (non)-activity is the critical characteristic that supports participants and not the reminding of participants to work on the program. Future research should investigate whether this speculation holds. Of note, we found no adverse effects of AE either. Therefore, AE can still be used to inform or instruct participants because e-mails are easy to program.

Strengths, Limitations, and future directions

The strengths of this trial are the large sample size for detecting effects of $d = 0.35$ and the factorial design, which allows having insight into the effects of several factors and their interactions. However, the study also has several limitations. First, the study sample was self-selected from the community. This selection limits the generalizability of our findings to clinical settings. Second, we had high dropout rates at post-treatment (34%) and follow-up (45%). To ensure privacy, we have asked participants to use an anonymous email address. As a result, we may have lost some participants because they did not check this address regularly. Third, our study sample was better educated than the general population. Fourth, we did not include a waiting list control condition in our study to evaluate the overall efficacy of the self-help program. However, the main purpose of this factorial trial was the investigation of the four supportive contextual factors. Fifth, we relied on self-report measures. Clinician-administered scales would have strengthened the study. Sixth, some participants dropped out from the first to the second randomization. Thus, our study might overestimate the effects of the intervention. Last, participants were mildly or moderately depressed. Therefore, our results may not generalize to more severely depressed individuals.

As current literature and our study suggest only a short-term effect of guidance, it would be interesting to investigate whether additional measures could establish a more lasting guidance impact. It might be that at the moment, the end of contact is too abrupt. Perhaps, participants would benefit from the possibility of further contact through booster sessions or guidance on demand. Future studies might also further investigate the relationship between diagnostic assessments and guidance.

Conclusion

The present study contributes to the knowledge of how to deliver web-based self-help programs for depression optimally. The overall picture emphasizes the importance of human guidance. Guided participants experienced a faster depression reduction and adhered more to

the treatment. Our study suggests that research on whether the positive effect of guidance can be sustained over time is needed. In contrast to guidance, the results for the other three factors are inconclusive and need further investigation. DIs could be stressful events for participants and might better be followed by a guided intervention afterward. Online MI might be rather detrimental. AE do not seem to influence outcomes.

Conflict of Interest

JPK received funding for clinical trials (German Federal Ministry of Health, Servier), payments for presentations on internet interventions (Oberberg, Servier, Stillachhaus), consulting fees (all about me, Ethypharm) payments for workshops and books (Beltz, Elsevier, Hogrefe and Springer) on psychotherapy for chronic depression and on psychiatric emergencies. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Role of the funding source

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CRediT authorship contribution statement

Oliver Thomas Bur: Conceptualization, Data collection/curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing - original draft, Writing – review & editing. **Tobias Krieger**: Conceptualization, Methodology, Writing – improvements of the original draft. **Steffen Moritz**: Data collection, Writing – improvements of the original draft, **Jan Philipp Klein**: Data collection, Writing – improvements of the original draft. **Thomas Berger**: Conceptualization, Funding acquisition, Investigation, Methodology, Resources, Supervision, Writing - original draft, Writing – review & editing.

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Figure Captions

Fig. 1. Participant flow from registration to 16-week follow-up

Fig. 2. Change in depressive symptoms with and without guidance.

Fig. 3. Change in depressive symptoms with or without guidance and with or without a diagnostic interview.

Appendices of Article III

Appendix of Article III: Tables for within the text

Variable	All groups (n = 316)		Guidance (n = 302)				DI (n = 316)				MI (n = 316)				AR (n = 302)			
			Yes (n = 150)		No (n = 152)		Yes (n = 157)		No (n = 159)		Yes (n = 159)		No (n = 157)		Yes (n = 154)		No (n = 148)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Age																		
Mean (SD)	38.0 (13.7)		38.1 (13.2)		38.8 (14.2)		39.3 (14.2)		36.6 (13.1)		39.8 (14.4)		36.1 (12.7)		38.5 (13.9)		38.4 (13.6)	
Range	19-78		19-69		19-78		19-69		19-78		19-69		19-78		19-78		19-69	
Gender																		
Male	88	27.9	37	24.7	44	29.0	39	24.8	49	30.8	50	31.5	38	24.2	39	25.3	42	28.3
Female	227	71.8	113	75.3	107	70.4	117	74.5	110	69.2	109	69.4	118	75.2	115	74.7	105	71.0
Non-binary	1	0.3	-	-	1	0.7	1	0.6	-	-	-	-	1	0.6	-	-	1	0.7
Marital Status																		
Single	197	62.3	98	65.3	86	56.6	95	60.5	102	64.2	96	60.4	101	64.3	96	62.3	88	59.5
Married	90	28.5	36	24.0	53	34.9	49	31.2	41	25.8	45	28.3	45	28.7	42	27.3	47	31.8
Divorced/widowed	24	7.6	13	8.67	11	7.2	13	8.3	11	6.9	15	9.4	9	5.7	14	9.1	10	6.8
Other	5	1.6	3	2	2	1.3	-	-	5	3.1	3	1.9	2	1.3	2	1.3	3	2.0
Education																		
Less than High school	5	1.6	3	2.0	2	1.3	2	1.3	3	1.9	3	1.9	2	1.3	1	0.7	4	2.7
High school diploma	63	19.9	25	16.7	35	23.0	32	20.4	31	19.5	32	20.1	31	19.7	29	18.8	31	20.9
University	186	58.9	91	60.7	87	57.2	85	54.1	101	63.5	86	54.1	100	63.7	92	59.7	86	58.1
Apprenticeship	62	19.6	31	20.7	28	18.4	38	24.2	24	15.1	38	23.9	24	15.3	32	20.8	27	18.2
Employment																		
Full-time paid work	71	22.5	37	24.7	29	19.1	40	25.5	31	19.5	38	23.9	33	21.0	34	22.1	32	21.6
Part-time paid work	117	37.0	52	34.7	63	41.4	51	32.5	66	41.5	54	34.0	63	40.1	58	37.7	57	38.5
Unemployed	22	7.0	9	6.9	13	8.6	13	8.3	9	5.7	14	8.8	8	5.1	12	7.8	10	6.8
Student	84	26.6	40	26.7	38	25.0	38	24.2	46	29.0	37	23.3	47	29.9	43	27.9	35	23.6
At-home Parent	6	1.9	4	2.7	1	0.7	5	3.2	1	0.6	5	3.1	1	0.6	2	1.3	3	2.0
Retired	16	5.1	8	5.3	8	5.3	10	6.4	6	3.8	11	6.9	5	3.2	5	3.3	11	7.4
Current psychological treatment	94	29.8		47	31.3	46		45	28.7	49	30.8	30.3	32.7	42	26.8	27.3	51	34.5
Current medications	64	20.3		29	19.3	35		37	23.6	27	17.0	23.0	21.4	30	19.1	20.8	32	21.6

Table 1. *Pre-treatment participant characteristics by factors.*

Table 2. *Estimated and observed means, 95% confidence intervals, and effect sizes for the primary outcome.*

		Observed and estimated means							Within-group effect sizes from pre-treatment		Post-treatment between-group effect sizes	Post to follow-up effect sizes
		Pre-treatment (observed)		Post-treatment (observed)		Post-treatment (estimated)	16 week Follow-up (observed)		To post-treatment	To 3-months follow-up		
	Measure	Mean (*SD*)	*n*	Mean (*SD*)	*n*		Mean (*SD*)	*n*	Cohen's *d*			
PHQ-9												
	Guidance (no)	9.1 (2.5)	152	7.7 (5.1)	97	7.5 (5.4)	6.6 (4.2)	82	0.38 (0.06 – 0.7)	0.72 (0.4 – 1.05)		0.19 (-0.13 – 0.5)
	Guidance (yes)	9.6 (2.6)	150	6.7 (3.9)	111	6.7 (5.1)	7.1 (4.0)	93	0.72 (0.39 – 1.05)	0.74 (0.41 – 1.07)	0.15 (-0.07 – 0.38)	-0.09 (-0.41 – 0.23)
	DI (no)	9.3 (2.6)	159	6.7 (3.6)	101	6.5 (3.5)	7.0 (3.7)	80	0.91 (0.58 – 1.24)	0.72 (0.4 – 1.04)		-0.14 (-0.45 – 0.17)
	DI (yes)	9.3 (2.5)	157	7.6 (5.2)	108	7.6 (5.2)	6.8 (4.5)	96	0.42 (0.1 – 0.73)	0.69 (0.37 – 1.01)	-0.25 (-0.47 - -0.03)	0.17 (-0.15 – 0.48)
	MI (no)	9.3 (2.6)	157	7.0 (4.2)	106	6.9 (5.3)	6.9 (3.8)	92	0.58 (0.26 – 0.89)	0.74 (0.41 – 1.06)		0 (-0.31 – 0.31)
	MI (yes)	9.3 (2.6)	159	7.4 (4.8)	103	7.2 (5.5)	6.9 (4.5)	84	0.49 (0.17 – 0.8)	0.65 (0.33 – 0.97)	-0.06 (-0.28 – 0.17)	0.06 (-0.25 – 0.37)
	AR (no)	9.4 (2.7)	148	7.1 (4.4)	103	6.9 (5.2)	7.0 (4.4)	79	0.60 (0.27 – 0.93)	0.66 (0.33 – 0.99)		-0.02 (-0.34 – 0.3)
	AR (yes)	9.3 (2.4)	154	7.3 (4.7)	105	7.3 (5.3)	6.8 (3.9)	96	0.49 (0.17 – 0.81)	0.77 (0.46 – 1.1)	-0.08 (-0.3 – 0.15)	0.11 (-0.2 – 0.42)

Appendix of Article III: A

Methods

Generalized Anxiety Disorder Questionnaire (GAD-7). The GAD-7 is a validated 7-item self-report measure of anxiety with a range of 0 to 21 (Spitzer, Kroenke, Williams, & Löwe, 2006). Cronbach's α for post-intervention data ranged from .74 – .83.

Patient Health Questionnaire – Stress (PHQ-Stress). The PHQ-Stress is a validated 10-item self-report measure of stress with a range of 0-20 (Gräfe, Zipfel, Herzog, & Löwe, 2004). Cronbach's α for post-intervention data ranged from .57 – .71.

Short Form Health Survey – 12 (SF-12). The SF-12 measures physical and mental aspects of health-related quality of life (Ware Jr, Kosinski, & Keller, 1996). Its two subscales capture general health, pain, disability in life, and mental problems. Cronbach's α for post-intervention data of the subscale *mental health* ranged from .68 – .83. For the subscale *physical health*, Cronbach's α ranged from .71 – .80.

Suicide Behaviours Questionnaire – Revised (SBQ-R). The SBQ-R is a 4-item self-report measure of suicidal behaviors, whith scores ranging from 3 – 22 (Osman et al., 2001). Cronbach's α for post-intervention data was .52. Since the SBQ-R was an exclusion criterion, baseline data were affected by substantial restriction of range and distorted reliability estimates (Stauffer & Mendoza, 2001).

Problem Solving Inventory – Revised (SPSI-R). The SPSI-R measures an individual's problem orientation (positive and negative) as well as problem-solving style (planful, avoidant, and impulsive) (D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Cronbach's α for post-intervention data ranged from .85 – .91.

Inventory for the Assessment of Negative Effects of Psychotherapy (INEP). The INEP assesses 15 possible negative effects of treatment (Ladwig, Rief, & Nestoriuc, 2014). The items assess a range of common changes participants experienced in their work and social environment. For each item, participants state whether the change was due to the treatment or other circumstances. Cronbach's α for post-intervention data was .53.

Client Satisfaction Questionnaire (CSQ-8). The CSQ-8 measures the global patient satisfaction with the treatment (Schmidt & Wittmann, 2002). Cronbach's α for post-intervention data was .93.

System Usability Scale (SUS). The SUS measures patients' perception of the usability of the software. It is a ten-item scale giving a global view of subjective assessments of usability of a technology system and ranges from 0-100 (Brooke, 1996). Cronbach's α for post-intervention data was .85.

Further included measures are the *Credibility/Expectancy Questionnaire (CEQ)* (Devilly & Borkovec, 2000) and the *Working alliance Inventory for Guided Internet Interventions (WAI-I)* (Gómez Penedo et al., 2019). Results on these measures will be presented elsewhere.

Appendix of Article III: B

Results

Secondary Outcomes

Observed (pre) and estimated (post) means, standard deviations, and Cohen's *d* effect sizes for secondary outcomes are shown in table 3 (appendix).

Adherence. T-tests revealed no differences in the composite adherence scores for the DI, the MI as well as the AE (*ps* > .11). However, guided participants adhered more to the program compared to unguided participants ($t_{260.9}$ = -4.66, p < .001, Figure 4). No interaction between the factors was significant (two-way ANOVAs, *p*s > .20). The composite adherence score significantly correlated with the pre-to-post changes in PHQ-9 (Kendall's τ = -0.11, p = .025).

GAD-7. Overall, participants were less anxious post-treatment ($F_{1, 226.8}$ = 60.58, p < .001). Effect sizes ranged from d = 0.34 – 0.72. As for depressive symptoms, guided participants were less anxious post-treatment compared to unguided participants ($F_{1, 226.8}$ = 5.65, p = .018, d = 0.28). A DI had no effect on anxiety at post-treatment ($F_{1, 226.8}$ = 0.79, p = .37, d = -0.07). There was a similar tendency as in depressive symptoms for the interaction of guidance and a DI. Guided participants with a DI tended to be less anxious compared to unguided participants with a DI ($F_{1, 226.8}$ = 2.76, p = .098).

PHQ-Stress. Overall, participants were less stressed post-treatment ($F_{1, 219.3}$ = 27.95, p < .001). Effect sizes ranged from d = 0.23 - 0.35. Guided participants were not less stressed post-treatment compared to unguided participants ($F_{1, 219.3}$ = 0.13, p = .72, d = 0.14). A DI had no effect on stress at post-treatment ($F_{1, 219.3}$ = 0.18, p = .67, d = 0.03). There was no interactive effect of guidance and the DI either ($F_{1, 219.3}$ = 0.46, p = .50).

SF-12 Mental Health. Overall, participants reported a higher quality of life at post-treatment ($F_{1, 215.6}$ = 46.35, p < .001). Effect sizes ranged from d = 0.34 - 0.58. Guided participants did not report higher quality of life post-treatment compared to unguided participants ($F_{1, 215.6}$ = 2.36, p = .13, d = 0.04). A DI had no effect on quality of life at post-treatment ($F_{1, 215.6}$ = 0.73, p = .79, d = 0.03). Similar to depressive symptoms, guided participants with a DI reported a higher quality of life at post-treatment compared to unguided participants with a DI ($F_{1, 215.6}$ = 10.67, p = .001).

SF-12 Physical Health. Surprisingly, participants reported less physical well-being post-treatment ($F_{1, 226}$ = 15.06, p < .001). Effect sizes ranged from d = - 0.36 – 0.22. Furthermore,

guided participants with a DI reported less physical well-being post-treatment compared to guided participants without a DI ($F_{1, 226} = 5.45$, $p = .02$, $d = 0.18$).

SPSI-R. The overall problem-solving score improved over time ($F_{1, 194.44} = 20.75$, $p < .001$). Effect sizes ranged from $d = 0.14 – 0.30$. Guided participants did not indicate a higher problem-solving score post-treatment compared to unguided participants ($F_{1, 194.4} = 0.48$, $p = .49$, $d = 0.22$). A DI had no effect on the problem-solving score post-treatment ($F_{1, 194.4} = 0.12$, $p = .73$, $d = 0.18$). There was no interactive effect of guidance and the DI either ($F_{1, 219.3} = 0.39$, $p = .53$).

Adherence. In other words, on average, guided participants clicked more in the program (123 vs. 63), worked on more topics (15 vs. 12), completed more exercises (21 vs. 12), and spent more hours online (5.04 vs. 2.75).

Appendix of Article III: C

Table C1. Estimated and observed means of other outcomes and between- and within-group effect sizes.

									Within-group effect sizes from pre-treatment		Post-treatment between-group effect sizes	Post to follow-up effect sizes
		Pre-treatment (observed)		Post-treatment (observed)		Post-treatment (estimated)	16 week Follow-up (observed)		To post-treatment	To 3-months follow-up		
Measure		Mean (*SD*)	*n*	Mean (*SD*)	*n*		Mean (*SD*)	*n*	Cohen's *d*			
GAD-7												
	Guidance (no)	7.9 (3.8)	152	6.7 (4.0)	97	6.5 (4.4)	5.8 (3.8)	82	0.34 (0.02 – 0.66)	0.55 (0.23 – 0.88)		0.17 (-0.15 – 0.49)
	Guidance (yes)	8.0 (3.3)	150	5.3 (3.2)	111	5.3 (4.1)	5.3 (3.2)	93	0.73 (0.4 – 1.06)	0.83 (0.5 – 1.16)	0.28 (0.06 – 0.51)	0 (-0.32 – 0.32)
	DI (no)	8.0 (3.5)	159	5.8 (3.4)	101	5.8 (4.5)	5.4 (3.3)	80	0.55 (0.23 – 0.86)	0.76 (0.44 – 1.08)		0.1 (-0.21 – 0.41)
	DI (yes)	7.8 (3.6)	157	6.1 (3.9)	108	6.1 (4.3)	5.7 (3.7)	96	0.43 (0.11 – 0.75)	0.58 (0.26 – 0.9)	-0.07 (-0.29 – 0.15)	0.1 (-0.21 – 0.41)
	MI (no)	8.0 (3.6)	157	5.8 (3.4)	106	5.8 (4.3)	5.6 (3.6)	92	0.56 (0.24 – 0.87)	0.67 (0.35 – 0.99)		0.05 (-0.26 – 0.36)
	MI (yes)	7.8 (3.5)	159	6.2 (3.9)	103	6.0 (4.4)	5.5 (3.4)	84	0.45 (0.14 – 0.77)	0.67 (0.35 – 0.99)	-0.05 (-0.27 – 0.18)	0.13 (-0.18 – 0.44)
	AE (no)	7.8 (3.7)	148	6.1 (3.9)	103	6.1 (4.2)	5.8 (4.1)	79	0.43 (0.1 – 0.76)	0.51 (0.19 – 0.84)		0.07 (-0.25 – 0.4)
	AE (yes)	8.2 (3.4)	154	5.9 (3.4)	105	5.8 (4.3)	5.3 (2.9)	96	0.62 (0.3 – 0.94)	0.92 (0.57 – 1.25)	0.07 (-0.16 – 0.3)	0.14 (-0.18 – 0.45)
PHQ-Stress												
	Guidance (no)	7.3 (3.3)	152	6.2 (3.5)	97	6.3 (4.3)	5.4 (3.1)	82	0.26 (-0.06 – 0.58)	0.59 (0.27 – 0.92)		0.24 (-0.08 – 0.56)
	Guidance (yes)	6.9 (3.4)	150	5.7 (3.8)	111	5.7 (4.1)	5.3 (3.2)	93	0.32 (0.00 – 0.64)	0.49 (0.16 – 0.81)	0.14 (-0.08 – 0.37)	0.11 (-0.21 – 0.43)
	DI (no)	7.1 (3.3)	159	5.9 (3.4)	101	6.1 (4.4)	5.7 (3.1)	80	0.26 (0.06 – 0.57)	0.43 (0.12 – 0.75)		0.11 (-0.21 – 0.42)
	DI (yes)	7.2 (3.4)	157	6.0 (3.8)	108	5.9 (4.2)	5.1 (3.2)	96	0.34 (0.03 – 0.66)	0.63 (0.32 – 0.96)	0.05 (-0.17 – 0.27)	0.21 (-0.1 – 0.53)
	MI (no)	7.0 (3.3)	157	5.7 (3.8)	106	5.7 (4.3)	5.5 (3.2)	92	0.34 (0.02 – 0.65)	0.46 (0.14 – 0.78)		0.05 (-0.26 – 0.37)
	MI (yes)	7.2 (3.4)	159	6.2 (3.5)	103	6.3 (4.4)	5.3 (3.2)	84	0.23 (0.08 – 0.54)	0.58 (0.26 – 0.89)	-0.14 (-0.36 – 0.08)	0.26 (-0.05 – 0.57)
	AE (no)	6.9 (3.2)	148	5.5 (3.6)	103	5.6 (4.2)	5.5 (3.5)	79	0.35 (0.02 – 0.67)	0.42 (0.09 – 0.74)		0.03 (-0.3 – 0.35)
	AE (yes)	7.3 (3.5)	154	6.3 (3.7)	105	6.4 (4.2)	5.3 (2.8)	96	0.23 (-0.08 – 0.55)	0.63 (0.31 – 0.96)	-0.19 (-0.42 – 0.04)	0.31 (-0.01 – 0.63)

									Within-group effect sizes from pre-treatment		Post-treatment between-group effect sizes	Post to follow-up effect sizes
		Pre-treatment (observed)		Post-treatment (observed)		Post-treatment (estimated)	16 week Follow-up (observed)		To post-treatment	To 3-months follow-up		
Measure		Mean (*SD*)	*n*	Mean (*SD*)	*n*		Mean (*SD*)	*n*	Cohen's *d*			
SF-12 PH												
	Guidance (no)	47.0 (5.6)	150	45.7 (5.5)	97	45.7 (6.3)	45.0 (5.0)	82	-0.22 (-0.54 – 0.1)	-0.38 (-0.7 – -0.05)		-0.12 (-0.44 – 0.2)
	Guidance (yes)	46.9 (4.8)	150	45.1 (4.7)	111	45.1 (5.9)	44.4 (5.0)	93	-0.34 (-0.66 – -0.01)	-0.51 (-0.84 -– -0.19)	-0.1 (-0.33 – 0.13)	-0.13 (-0.45 – 0.19
	DI (no)	46.9 (4.7)	158	45.4 (4.7)	101	45.2 (6.4)	44.8 (5.1)	80	-0.3 (-0.62 – 0.01)	-0.43 (-0.74 – -0.11)		-0.07 (-0.38 – 0.24)
	DI (yes)	47.1 (5.6)	156	45.4 (5.5)	108	45.5 (6.1)	44.7 (5.0)	96	-0.27 (-0.59 – 0.04)	-0.45 (-0.77 – -0.13)	0.05 (-0.17 – 0.27)	-0.14 (-0.46 -0.17)
	MI (no)	47.1 (4.9)	157	46.0 (4.8)	106	45.9 (6.2)	45.4 (5.1)	92	-0.22 (-0.53 – 0.1)	-0.34 (-0.65 – -0.03)		-0.09 (-0.40 – 0.23)
	MI (yes)	46.9 (5.4)	157	44.8 (5.3)	103	44.8 (6.3)	44.0 (4.8)	84	-0.36 (-0.67 – -0.04)	-0.56 (-0.89 – -0.25)	-0.18 (-0.4 – 0.05)	-0.14 (-0.46 – 0.17)
	AE (no)	46.8 (5.0)	148	44.8 (5.2)	103	44.9 (6.1)	43.7 (5.0)	79	-0.34 (-0.67 – -0.02)	-0.62 (-0.95 – -0.29)		-0.22 (-0.54 – 0.11)
	AE (yes)	47.1 (5.4)	152	45.9 (5.0)	105	45.8 (6.1)	45.6 (4.9)	96	-0.23 (-0.55 – 0.09)	-0.29 (-0.61 – -0.03)	0.15 (-0.08 – 0.37)	-0.04 (-0.35 – 0.28)
SF-12 MH												
	Guidance (no)	38.1 (6.0)	150	40.4 (6.8)	97	40.7 (8.4)	42.3 (6.6)	82	0.36 (0.03 – 0.68)	0.67 (0.34 – 1.0)		0.21 (-0.11 – 0.53)
	Guidance (yes)	37.7 (6.7)	150	41.7 (7.2)	111	41.7 (8.0)	42.5 (7.2)	93	0.54 (0.22 – 0.87)	0.69 (0.36 – 1.02)	0.12 (-0.11 - 0.35)	0.11 (-0.22 – 0.43)
	DI (no)	37.9 (6.0)	158	41.1 (7.1)	101	41.4 (8.6)	42.9 (7.0)	80	0.47 (0.16 – 0.79)	0.78 (0.44 – 1.09)		0.19 (-0.12 – 0.5)
	DI (yes)	37.7 (6.6)	156	41.0 (7.0)	108	41.0 (8.2)	41.9 (6.8)	96	0.44 (0.13 – 0.76)	0.63 (0.31 – 0.95)	-0.05 (-0.27 – 0.17)	0.12 (-0.2 – 0.43)
	MI (no)	37.7 (6.3)	157	41.0 (7.1)	106	41.1 (8.3)	42.6 (7.1)	92	0.46 (0.14 – 0.78)	0.73 (0.41 – 1.05)		0.19 (-0.12 – 0.51)
	MI (yes)	37.9 (6.4)	157	41.1 (7.0)	103	41.3 (8.5)	42.2 (6.7)	84	0.45 (0.14 – 0.77)	0.66 (0.34 – 0.98)	0.02 (-0.2 – 0.25)	0.12 (-0.2 -0.43)
	AE (no)	37.5 (6.2)	148	41.7 (7.0)	103	41.7 (8.2)	43.1 (6.7)	79	0.58 (0.25 – 0.91)	0.87 (0.53 – 1.21)		0.19 (-0.14 – 0.51)
	AE (yes)	38.2 (6.5)	152	40.5 (7.0)	105	40.7 (8.2)	41.9 (7.0)	96	0.34 (0.02 – 0.66)	0.55 (0.22 – 0.87)	-0.12 (-0.35– 0.11)	0.16 (-0.16 – 0.48)
SPSI-R												
	Guidance (no)	10.6 (2.3)	152	10.9 (2.4)	97	11.1 (3.1)	11.0 (2.5)	82	0.18 (-0.14 – 0.5)	0.17 (-0.15 – 0.49)		-0.04 (-0.35 – 0.28)
	Guidance (yes)	11.0 (2.4)	150	11.8 (2.9)	111	11.7 (3.0)	11.9 (2.6)	93	0.26 (-0.06 – 0.58)	0.36 (0.04 – 0.68)	0.2 (-0.03 – 0.42)	0.07 (-0.25 – 0.39)
	DI (no)	10.5 (2.4)	159	11.0 (2.9)	101	11.2 (3.1)	11.3 (2.7)	80	0.25 (-0.06 – 0.57)	0.31 (0 – 0.63)		0.03 (-0.28 – 0.35)
	DI (yes)	11.2 (2.3)	157	11.6 (2.6)	108	11.7 (3.1)	11.6 (2.5)	96	0.18 (-0.13 – 0.5)	0.17 (-0.15 – 0.48)	0.16 (-0.06 – 0.38)	-0.04 (-0.35 – 0.28)
	MI (no)	11.0 (2.3)	157	11.7 (2.6)	106	11.8 (3.1)	11.7 (2.6)	92	0.29 (-0.02 – 0.61)	0.29 (0.03 – 0.6)		-0.04 (-0.35 – 0.28)
	MI (yes)	10.7 (2.5)	159	10.9 (2.8)	103	11.1 (3.1)	11.2 (2.6)	84	0.14 (-0.17 – 0.45)	0.2 (-0.12 – 0.51)	-0.23 (-0.45 – -0.01)	0.04 (-0.28 – 0.35)
	AE (no)	10.7 (2.6)	148	11.0 (3.1)	103	11.1 (3.0)	11.3 (3.0)	79	0.14 (-0.18 – 0.46)	0.21 (-0.11 – 0.54)		0.07 (-0.26 – 0.39)
	AE (yes)	10.9 (2.2)	154	11.7 (2.3)	105	11.7 (3.0)	11.6 (2.2)	96	0.3 (-0.01 – 0.62)	0.32 (0 – 0.64)	0.2 (-0.03 – 0.43)	-0.04 (-0.35 – 0.28)

Table C2. Experimental conditions of the randomized full factorial design

Condition	**Guidance**	**DI**	**MI**	**AE**	***n***
1	+	+	+	+	19
2	+	+	+	-	17
3	+	+	-	+	18
4	+	+	-	-	18
5	+	-	+	+	20
6	+	-	+	-	19
7	+	-	-	+	20
8	+	-	-	-	19
9	-	+	+	+	19
10	-	+	+	-	18
11	-	+	-	+	19
12	-	+	-	-	18
13	-	-	+	+	19
14	-	-	+	-	19
15	-	-	-	+	20
16	-	-	-	-	20

Note. Every factor is equally often present (+) or absent (-). All factors are orthogonal to each other. Each effect estimate involves all 16 of the conditions in the table.

Appendix D: Article IV

Working Alliance Mediates the Effect of Guidance in a Web-Based Program for Participants With Mild to Moderate Depressive Symptoms: A Secondary Mediation Analysis

Bur, O. T., Bielinski, L. L., Krauss, S., Häfliger, A., Guggisberg, J., Krieger, T., & Berger, T. Working Alliance Mediates the Effect of Guidance in a Web-Based Program for Participants With Mild to Moderate Depressive Symptoms: A Secondary Mediation Analysis. *Manuscript submitted to the journal Internet Interventions.*

Working Alliance Mediates the Effect of Guidance in a Web-Based Program for Participants with Mild to Moderate Depressive Symptoms: A Secondary Mediation Analysis

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Abstract

Guided web-based self-help programs for individuals with depressive symptoms have shown to be more efficacious than unguided programs. However, research has paid little attention to why guided interventions are superior. The present study investigated whether working alliance mediated the effect of guidance on depressive symptom outcome.

The study is a secondary analysis of a randomized factorial trial. In the trial, 302 adults with mild to moderate depressive symptoms (Patient Health Questionnaire–9 score: 5-14) were randomized to either a guided or an unguided group. All participants received access to a web-based self-help program based on problem-solving therapy. Working alliance with the treatment providers was assessed using an adapted version of the Working Alliance Inventory for Guided Internet Interventions two weeks (early-treatment) and eight weeks (post-treatment) after pre-treatment. The primary outcome was depressive symptoms at post-treatment.

The total working alliance score was significantly higher for guided participants compared to unguided participants (at early-treatment: $t_{248.6} = -3.36$, $p < .001$, $d = 0.42$, at post-treatment: $t_{194.9} = -4.77$, $p < .001$, $d = 0.66$). The total working alliance score correlated significantly with the change in depressive symptoms for guided ($rs = .16, .34$) and unguided participants ($rs = .26, .23$). Furthermore, the WAI-I total score statistically mediated the relationship between guidance and outcome (at early-treatment: $B = -.028$, at post-treatment: $B = -.053$). The subscale tasks (at post-treatment: $B = -.051$) and the subscale goals (at early-treatment: $B = -.031$ and at post-treatment: $B = -.052$) also mediated the relationship between guidance and outcome.

These findings indicate that guidance increases working alliance to treatment providers as early as two weeks after treatment beginning. The alliance predicts outcome and mediates the relationship between guidance and outcome. Participants' agreement with tasks

and goals of a program seems to be more important than the bond with treatment providers. Treatment providers might therefore attune web-based programs to the preferences and expectations of participants. We discuss the difference in working alliance between guided and unguided participants, the benefit of a good working alliance online, and clinical implications of measuring the working alliance early in treatment.

Keywords: web-based self-help program, internet intervention, depression, guidance, working alliance, mediation

Introduction

Guided web-based programs have shown to reduce depressive symptoms efficaciously. They are usually associated with larger effects than unguided web-based programs and tend to achieve equivalent effects to face-to-face psychotherapies (Andersson et al., 2014; Bur et al., 2022; Carlbring et al., 2018; Karyotaki et al., 2021; Moshe et al., 2021). While there has been increased attention to whether guided interventions are superior to unguided interventions, research has paid little attention to why guidance is associated with better treatment outcomes. Consequently, we do not know how guidance leads to greater symptom improvement. However, by understanding the processes that explain the effect of guidance, one might identify and convey the essential facets of guidance and understand what is needed to improve treatment outcomes.

One approach to investigate how guidance works is to examine possible mediators through which guidance might achieve its effect. A mediator statistically accounts for a relationship between an independent and a dependent variable (Kazdin, 2007; Kazdin, 2009). This can imply that the mediator itself is the mechanism that explains change precisely. More likely, however, a mediator serves as a proxy for one or more variables with which it correlates (Kazdin, 2009). In that case, the mediator points at the underlying mechanism that produces change and is, therefore, a first hint of how change occurs.

An extensively studied process variable and potential mediator of symptom change in face-to-face psychotherapy is the working alliance. This concept traces back to Bordin (1979), who defines the working alliance as 1) the emotional bond between a patient and a therapist, 2) shared agreement with the tasks of therapy, and 3) shared agreement with the goals of therapy. The working alliance is often measured with the Working Alliance Inventory (WAI; Horvath & Greenberg, 1989), and many studies underpin that a good working alliance is associated with a better treatment outcome. Several meta-analyses have shown that the

alliance predicts treatment outcome in face-to-face therapies (*rs* = .22 - .28; Flückiger et al., 2018; Horvath et al., 2011; Martin et al., 2000). Furthermore, a recent review has shown that in most studies, depressive symptom change was partially mediated by the alliance (Baier et al., 2020).

The importance of the working alliance seems not to be restricted to face-to-face psychotherapy. Reviews on the alliance in online therapy concluded that independent of communication modalities (e.g., email, videoconferencing), diagnostic groups, and amount of contact between clients and therapists, client-rated alliance scores were high, and roughly equivalent to alliance ratings found in studies on face-to-face psychotherapy (Berger, 2017; Pihlaja et al., 2018). Furthermore, several meta-analyses have shown that the working alliance is associated with better outcomes in guided web-based programs (*rs* = .20 – .28; Flückiger et al., 2018; Kaiser et al., 2021; Probst et al., 2019). These findings are noteworthy because in guided self-help interventions, the therapists' tasks are often limited to reinforce participant's independent work, provide feedback on participant's progress, and answer participant's questions.

The working alliance's role in guided web-based programs for depression has not been conclusively clarified. Within the three meta-analyses on web-based programs mentioned in the previous paragraph, eight studies investigated depressive symptoms as the primary outcome. Whereas half of the studies reported significant positive correlations between the working alliance and depressive symptom change (Anderson et al., 2018; Meyer et al., 2015; Gómez Penedo et al., 2020, Preschl et al., 2011), half did not (Andersson et al., 2012; Hadjistavropoulos et al., 2017; Ormrod et al., 2010; Richards et al., 2013). Furthermore, Preschl et al. (2011) found the positive association only for WAI measures assessed at post- but not mid-treatment. Thus, it is unclear whether the alliance promoted depressive symptom reduction, whether patients with fewer depressive symptoms rated the working alliance as

higher or whether a third variable influenced both the alliance ratings and depressive symptoms. Finally, the eight studies used different measures to assess the working alliance and provided varying amounts of guidance during treatment. This heterogeneity complicates conclusions about the relationship between the working alliance and depressive symptoms. Consequently, more studies are needed that clarify the relationship of early working alliance ratings on depressive symptoms in guided web-based programs.

The current study is a secondary analysis of data from a randomized factorial trial. In the trial, we investigated the context of support of a web-based self-help program for depressive symptoms (Bur et al., 2022). We found that guidance was associated with significantly better outcomes at post-treatment. Although several meta-analyses have suggested this finding before (Karyotaki et al., 2021; Moshe et al., 2021; Spek et al., 2007), to the best of our knowledge, no study has so far investigated why guided interventions seem to be superior to unguided interventions. Based on previous literature, we hypothesised that the working alliance might play a role in explaining the superiority of guided programs. Therefore, we investigated three research questions: First, we investigated whether guided participants showed a higher working alliance with the treatment providers than unguided participants. Second, we investigated whether the working alliance correlated positively with depression change scores. Third, we took a closer look at the role of the working alliance as a possible mediator for the relationship between guidance and outcome. We hypothesized that, similar to most face-to-face psychotherapy studies (cf. Baier et al., 2020), the working alliance mediates the effect of guidance on depressive symptom outcomes.

Methods

Participants

Participant data for the present analyses came from the HERMES trial (Bur et al., 2022). Individuals were allowed to take part in the study if they 1) were at least 18 years of

age, 2) indicated mild to moderate depressive symptoms on the Patient Health Questionnaire-9 (PHQ-9 score between 5-14; Kroenke et al., 2001), 3) provided written informed consent, 4) had access to the internet and an email account, and 5) provided an emergency contact. Individuals were not allowed to take part in the study if they 1) reported a present or past psychotic or bipolar disorder, or 2) indicated increased suicidal tendencies on the Suicidal Behavior Questionnaire-Revised (SBQ-R > 7; Osman et al., 2001). Participants were recruited online via our study website. Participants had to complete and return a consent form before completing the pre-treatment online questionnaire, which checked for eligibility. Of note, participants taking medication or seeing a psychotherapist could participate in the study. Participants were not compensated for taking part in the study.

Participant characteristics are shown in Table 1. Participants of this study were on average 38.4 years of age (*SD* = 13.7, range: 19-78). Most participants were female (72.8%), single (60.9%) and Swiss (50.7%) or German (43.7%). Furthermore, most participants reported a university degree (58.9%) and part- or full-time employment (59.0%). About one-third of the participants were in concurrent psychological treatment (30.8%), and about one-fifth used prescribed medication for mental disorders (21.2%) at pre-treatment.

Study design

HERMES was a randomized full factorial trial, which included four experimental factors (1; guidance, 2; a diagnostic interview, 3; a motivational interviewing module, 4; automated emails). Each factor was varied at two levels (either present, coded as +1, or absent, coded as -1; i.e., effect coded), resulting in a 16-condition (2x2x2x2) trial (Bur et al., 2022). In the present paper, we focused on comparing guided vs. unguided conditions since guidance was the only factor that significantly improved outcomes. The ethics committee of the canton of Bern approved the study on January 20, 2020 (2019-01795), and the study is registered at ClinicalTrials.gov (NCT04318236).

Procedure

HERMES participants were randomized by Qualtrics (XM) to either guided or unguided conditions. The randomization was stratified for mild (PHQ-9: 5-9) or moderate (PHQ-9: 10-14; Kroenke et al., 2001) depressive symptoms, and the randomization schemes were concealed from both the participants and the study staff. During the eight weeks of working on the web-based program, guided participants (n = 150) were supported by clinical psychologists (supervised master students in their last term of a graduate program in clinical psychology and psychotherapy and a Ph.D. student in clinical psychology and psychotherapy). At the beginning of the treatment, the psychologists introduced themselves and explained that the participant could ask questions at any time. The psychologists wrote an email to the participants each week, to provide feedback on the participants' behavior and progress in the self-help program. These emails were sent in a secured email system integrated into the self-help program. Emails did not include further therapeutic advice. The most important aspects of the feedback were crediting and reinforcing participants' independent work. The psychologists asked if participants were facing any problems and if they needed support, whenever guided participants did not work for a week with the program. Psychologists answered questions within the next three days. In total, the psychologists sent 1,140 messages to the 139 participants who had logged in at least once (8.2 messages per participant). Furthermore, the psychologists spent 107 minutes per participant (SD = 62.8) and 12.6 minutes per message (SD = 6.5). Unguided participants received an automated introductory email. They had no further contact with the treatment providers, except if they asked technical questions regarding the use of the program (Bur et al., 2022).

Measures

For the current study, we used assessments measured at pre-treatment, two weeks after pre-treatment (early-treatment), and eight weeks after pre-treatment (post-treatment). All

assessments were self-reports and completed via Qualtrics. In the following paragraphs, the measures relevant to the analyses in this paper are discussed in detail. A full list of measures assessed in the trial can be found in a different publication (Bur et al., 2021).

Primary Outcome

Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001). The primary outcome was the PHQ-9 at post-treatment. The PHQ-9 is a validated 9-item self-report measure of depressive symptoms with a range of 0 to 27 (Kroenke et al., 2001). Cronbach's α for post-intervention data was .84. Since the PHQ-9 served as an inclusion criterion, pre-treatment data were affected by substantial restriction of range and distorted reliability estimates (Stauffer & Mendoza, 2001).

Mediator

Working Alliance Inventory for Guided Internet Interventions (WAI-I; *Gómez Penedo et al., 2019).* The mediator examined in the current study was the working alliance, measured with the WAI-I (*Gómez Penedo et al., 2019). We adapted the wording of the original WAI-I to fit the specifications of our study*. Specifically, the four items of the *bond* subscale were rephrased to refer to the acceptance and trust between the patient and the treatment providers. The treatment providers included both the human contact prior to the treatment as well as the contact with psychologists who provided guidance. Therefore, the WAI-I questionnaire was answerable for both guided and unguided participants. In the original version, the items of the *bond* subscale referred to the acceptance and trust between the patient and the psychologist who provided guidance only (Gómez Penedo et al., 2019*).* The four items of the *goals* subscale and the four items of the *tasks* subscale remained the same as in the original WAI-I, i.e., they referred to the patient's agreement with the web-based program's goals and tasks. The WAI-I was assessed at early-treatment and at post-treatment. Cronbach's α at early-

treatment was .90 for the total score, .87 for the subscale tasks, .81 for the subscale goals, and .88 for the subscale bond, respectively.

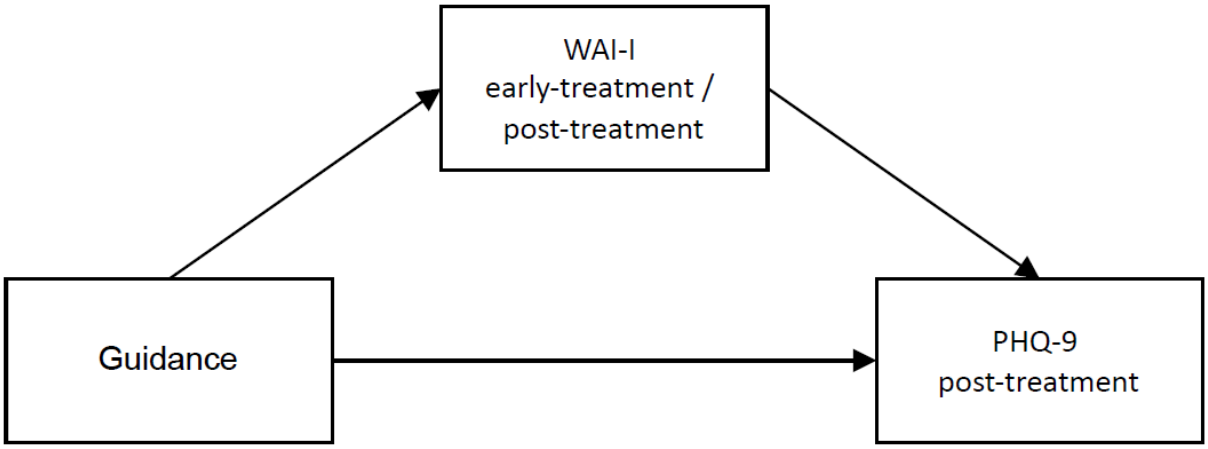

Fig. 1. Mediation model with guidance as grouping variable (guided/unguided), WAI-I (*Working Alliance Inventory for Guided Internet Interventions) as mediator, and PHQ-9 (Patient Health Questionnaire-9) as outcome variable.* Pre-treatment depression scores were controlled for.

Statistical analyses

We tested group differences between the unguided and guided conditions with *t*-tests for continuously distributed variables and χ^2-tests of independence for categorical variables for pre-treatment and demographic measures. For the associations of the working alliance and depressive symptom outcome, we calculated partial correlations. Thereby, we correlated WAI-I measures with the pre- to post-treatment change in depressive symptoms while controlling for pre-treatment depressive symptoms prior to the allocation to the guidance conditions. In the mediation analyses, we tested whether the effect of guidance on depressive symptoms at post-treatment was mediated by working alliance at early- and post-treatment, while again controlling for the level of pre-treatment depressive symptoms. To test our mediation hypotheses, we employed structural equation modeling (SEM), using

the *lavaan* package (Rosseel, 2012) for R (Version 3.5.2) and R Studio (Version 1.3.1093). To deal with missing values, we employed full information maximum likelihood estimation to fit models directly to the raw data (Schafer & Graham, 2002). Model fit was assessed with the comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). Good fit was indicated by values equal to or higher than .95 for CFI, equal to or less than .08 for SRMR, and equal to or less than .06 for RMSEA (Hu & Bentler, 1999). We used multiple indicators to measure working alliance and depressive symptoms as latent variables, which allowed us to control for measurement error. Working alliance was measured by three indicators (i.e., the three subscales of the WAI-I) and depressive symptoms were measured by three random parcels consisting of the items from the PHQ-9. To examine the significance of the indirect effects, we computed bootstrapped bias-corrected 95% confidence intervals. Bootstrapping runs many data simulations based on randomly selected observations with replacements from the data. Therefore, it does not make assumptions regarding the shape of the distribution of the indirect effect but uses its empirical distribution. Bootstrapping is regarded as superior to the method of Baron and Kenny (1986) because it has greater statistical power and yields more accurate estimates of the confidence intervals (Shrout & Bolger, 2002). The point estimate of the indirect effect is considered statistically different from zero, if zero is not included in the 95% confidence interval. The indirect mediation effect sizes were interpreted as .03 being a small effect, .07 being a medium effect, and .12 being a large effect.

Results

Pre-treatment evaluation and dropouts from the study

There were no pre-treatment group differences between the guided and the unguided group regarding demographics, depressive symptoms, current psychotherapeutic treatment, and current medication (Table 1). Participants who failed to fill in post-treatment

questionnaires were considered dropouts. Of the total sample size (n = 302), 208 individuals (68.9%) completed post-treatment questionnaires. There were no significant differences in demographics for completers and dropouts (*ps* > .10). However, guided participants were more likely to complete post-treatment questionnaires ($t_1 = 4.60$, $p = .03$). Furthermore, participants with a higher working alliance rating at early-treatment ($t_{65.1} = -2.14$, $p = .04$) were more likely to complete post-treatment questionnaires. Little's MCAR test resulted in $\chi^2 = 61.39$ (df = 48, $p > .05$), indicating that data was missing at random.

Intervention outcomes

Results from the factorial trial have been published in a previous paper (Bur et al., 2022). Both guided ($d = 0.72$) and unguided participants ($d = 0.38$) showed a statistically significant decrease in depressive symptoms at post-treatment. There was a small but statistically significant between-group effect in favour of guidance ($d = 0.15$).

Working alliance

Results concerning the working alliance were not reported in the main outcome paper and are reported here. Descriptive information on means and standard deviations of depressive symptoms and working alliance across time is reported in Table 2. At early-treatment, the total score of the working alliance was significantly higher for guided participants compared to unguided participants ($t_{248.6} = -3.36$, $p < .001$, $d = 0.42$). For the two subscales tasks ($t_{248.1} = -0.11$, $p = .92$, $d = 0.01$) and goals ($t_{247.2} = -1.74$, $p = .08$, $d = 0.22$), there was no significant difference between the two groups. However, for the subscale bond, the score was significantly higher for guided participants ($t_{248.1} = -5.64$, $p < .001$, $d = 0.71$). A similar pattern emerged at post-treatment. The total score of the working alliance was significantly higher for guided participants compared to unguided participants ($t_{194.9} = -4.77$, $p < .001$, $d = 0.66$). For the subscale tasks there was no significant difference between both groups ($t_{202.5} = -1.92$, $p = .06$, $d = 0.27$). However, in the two subscales goals

($t_{198.5} = -2.90$, $p < .01$, $d = 0.40$) and bond ($t_{170.6} = -5.88$, $p < .001$, $d = 0.84$), the score was significantly higher for guided participants.

Working alliance and change in depressive symptoms

The total score of the working alliance and change in depressive symptoms correlated significantly at early- and post-treatment for both groups (*rs* = .16 - .34). Further partial correlations, controlling for pre-treatment depressive symptoms, between WAI-I (sub)scales and change in depressive symptoms can be found in Table 3.

Mediation analyses

Overall, the mediation models fit the data with CFI above .95, SRMR below .08, and RMSEA below or close to .06 (Table 4). Thus, the fit of the models tested was acceptable to good.

Mediation with the total score of working alliance

To test for mediation and assess its effect size, we examined the direct and indirect effect of guidance on depressive symptoms at post-treatment, controlling for the pre-treatment level of depressive symptoms. The results of the mediation analyses are reported in Tables 5 and 6, including the standardized and unstandardized estimates of the total effect, the direct effect, and the indirect effect. For the unstandardized estimates, bootstrapped bias-corrected 95% confidence intervals were computed. For the WAI-I total scores, the indirect effect differed significantly from zero. Thus, the effect of guidance on depressive symptoms at post-treatment was mediated by the working alliance at early- and at post-treatment. For WAI-I-total at early-treatment, the standardized estimate of the indirect effect was *B* = -.028, indicating a small effect (accounting for 20.7% of the total effect). For WAI-I-total at post-treatment, the standardized estimate of the indirect effect was *B* = -.053, indicating a small to medium effect (accounting for 46.1% of the total effect).

Mediations with the subscales tasks, goals and bond

Of the three subscales of the WAI-I at early-treatment, only the subscale goals mediated the effect of guidance on depressive symptoms. The standardized estimate of the indirect effect was B = -.031, indicating a small mediation effect (accounting for 22.6% of the total effect). Of the three subscales of the WAI-I at post-treatment, both the subscales tasks (B = -.051; accounting for 39.8% of the total effect) and goals (B = -.052; accounting for 46.8% of the total effect) indicated a small to medium mediation effect.

Discussion

In this study, we took a closer look at the previous finding that guided participants reported fewer depressive symptoms post-treatment than unguided participants (Bur et al., 2022). We hypothesized that the working alliance plays a role in explaining this finding. Our results support this hypothesis to some extent. First, guided participants reported a higher total working alliance than unguided participants. Second, the working alliance significantly correlated with the change in depressive symptoms for guided and unguided groups (rs = .16 - .34). Third, the total scores of the working alliance at early- and post-treatment significantly mediated the relationship between guidance and depressive symptoms. Furthermore, the subscale tasks (at post-treatment) and the subscales goals (at early- and post-treatment) mediated the relationship between guidance and depressive symptoms.

Compared to unguided participants, guided participants showed a significantly higher working alliance. This difference mainly emerged because guided participants scored significantly higher on the bond subscale. Thus, participants seem to bond more strongly with the treatment providers through additional contact with a psychologist during treatment. This finding may not be intuitively surprising, but it is noteworthy since the alliance was measured quite early in treatment, i.e., two weeks after it began. At this time, guided participants had received just two emails from the treatment providers. Therefore, a small amount of additional

contact may be sufficient to strengthen the bond between participants and treatment providers significantly. However, it could also be that not the actual contact itself increases the working alliance; rather that guided participants know a human person will support them during treatment. Therefore, guided participants might perceive the treatment as more credible, more suitable, or have higher treatment expectations (Heim et al., 2018).

A good working alliance seems to be related to a better outcome. The alliance's total score (at early- and post-treatment) significantly correlated with the change in depressive symptoms for the guided group (*rs* = .16, .34) and for the unguided group (*rs* = .26, .23). This finding is in line with previous meta-analyses that have found significant correlations (*rs* = .20 – .28) between the working alliance and outcomes for guided web-based programs (Flückiger et al., 2018; Kaiser et al., 2021; Probst et al., 2019). However, for depressive symptoms, only half of the studies included in these meta-analyses found a significant association. Therefore, our findings reinforce the notion that the working alliance does play a role in guided web-based programs for depressive symptoms. Furthermore, when looking at the alliance subscales, the subscale tasks was significantly correlated with outcome for guided and unguided conditions at both timepoints, the subscale goals was significantly correlated with outcome for guided and unguided conditions at post-treatment only, and bond was not significantly correlated for guided and unguided conditions. This finding, too, aligns with previous literature for guided web-based programs (Berger et al., 2017; Gómez Penedo et al., 2020; Probst et al., 2019) and highlights that participants' perception of how well the tasks and goals of a web-based program suits them seems important. Meyer et al. (2015) interpreted a similar finding to mean that participants have a good sense early in the treatment about how helpful an intervention will be. This perceived helpfulness, plausibility, or personal fit might be an essential predictor in internet interventions, whereas the personal bond to the treatment providers might be less critical (Berger et al., 2014). Therefore, treatment providers might attune web-based programs

to the preferences and expectations of participants to amplify participants' agreement with tasks and goals of an intervention. Of note, our results suggest that unguided participants might benefit from such an attunement as well.

The working alliance not only correlated positively with change in depressive symptoms but also mediated the relationship between guidance and depressive symptoms (explaining 20.7 % of the total effect at early-treatment and 46.1% at post-treatment). These findings further highlight the importance of an online working alliance and equal findings from face-to-face studies (Baier et al., 2020). Significant mediations were also found for the subscale tasks (at post-treatment) and the subscale goals (both early- and post-treatment). These findings could be interpreted in line with the term collaboration, which is seen as an essential and CBT-specific element of the therapeutic relationship (Kazantzis et al., 2017). In CBT, collaboration focuses on the therapist's role as a facilitator of the clients' progress towards his or her own goals. Applied to internet-based self-help, this would mean that the support of a psychologist facilitates this progress as well.

We draw two practical implications from the results on the relationship between guidance, alliance, and outcome. The first implication is that internet-based treatment providers should be made aware of the link between guidance, alliance, and outcome. Treatment providers may assess the working alliance as early as two weeks after treatment begins and intensify or change the mode of support, e.g., face-to-face contact in participants with low early working alliance.

The second implication of the results is that the common practice of guiding participants throughout a web-based program could potentially be modified. Although the mediating effect of alliance increases from early- to post treatment, little contact with treatment providers (two emails in two weeks) at early-treatment already affects working alliance and outcome positively. This could be used as an advantage for internet-based

treatments. Instead of guiding participants throughout the entire treatment, it might be equally effective to guide them into the treatment and, possibly, just provide guidance on demand or standardized feedback afterward. While meta-analyses found that guidance is superior to non-guidance (e.g., Karyotaki et al., 2021; Moshe et al., 2021), this does not imply that other forms of guidance and contact are less effective than the guidance usually provided. For example, Zagorscak et al. (2018) found that standardized feedback was equally effective as regular guidance. Furthermore, some studies found no difference in outcomes whether participants were regularly guided or only received guidance on demand (Dahlin et al., 2020, Hadjistavropoulos et al., 2017). Thus, by considering our findings on alliance as a mediator, guidance might be limited to an initial phase of treatment while maintaining the effect on outcome. A reduction of the "dose" of guidance could produce three benefits. First, therapists could spend less time per participant and free up resources. Second, therapists might invest their free resources for participants who do not respond to treatment and need more guidance. Third, unguided treatments could be significantly improved with little effort, i.e., by adding initial guidance.

Strengths and limitations

To the best of our knowledge, this is the first study to examine alliance as a possible mediator of guidance in a web-based program for depression. Another strength of this study is that the assessment of the early working alliance meets the requirement that a mediator should temporally precede the outcome (Kazdin, 2007). However, this study also has several limitations. First, the general limitations mentioned in the study by Bur and colleagues (2022) also apply for the analyses presented in this paper (results may not generalize to participants with more severe depressive symptoms, the study sample was self-selected from the community and reliance on self-report measures instead of clinician-administered scales). Second, although the mediation effect of the bond subscale was small to medium, it did not

reach statistical significance. This might have been due to too little statistical power. Third, the alliance was measured only twice during treatment. Measuring the alliance repeatedly throughout treatment might reveal more complex relationships between guidance, working alliance and outcome. Such studies might reveal whether the importance of working alliance varies throughout treatment, as has been done for face-to-face psychotherapies (e.g., Volz et al., 2021).

Conclusion

In this study, guided participants reported a higher total working alliance than unguided participants. The working alliance was significantly correlated with the change in depressive symptoms (*rs* = .16 - .34) for guided and unguided participants and mediated the relationship between guidance and depressive symptoms. The participants' agreement on tasks and goals of the web-based program intervention seems to be more important than the bond to treatment providers. Therefore, treatment providers might attune web-based programs to the preferences and expectations of participants. Since working alliance at early-treatment mediates the effect of guidance on outcome, guidance throughout the whole treatment might not be necessary. Guided interventions might achieve similar effects when reduced to initial guidance. Similarly, unguided interventions might achieve better results with initial guidance. Future studies should investigate whether a reduced "dose" of guidance is indeed equally effective as regular guidance.

Conflict of Interest

None.

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CRediT authorship contribution statement

Oliver Thomas Bur: Conceptualization, Data collection/curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing - original draft, Writing – review & editing. **Laura Luisa Bielinski**: Conceptualization, Investigation, Writing – original draft, Writing – review & editing. **Samantha Krauss**: Formal analysis, Writing - original draft. **Andrea Häfliger**: Tables and references, Review of literature. **Jasmin Guggisberg**: Review of literature. **Tobias Krieger**: Writing – improvements of the original draft. **Thomas Berger**: Conceptualization, Investigation, Supervision, Writing - original draft, Writing – review & editing.

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Appendix of Article IV: Tables

Table 1. Pre-treatment demographics and characteristics overall, for guided, and for unguided groups.

Characteristic	Total sample (N = 302)		Guided (n = 150)		Unguided (n = 152)		Statistic
	n	%	n	%	n	%	
Age							
Mean (SD)	38.4 (13.7)		38.1 (13.2)		38.8 (14.2)		
Range	19-78		19-69		19-78		$t_{298.9} = 0.45$, $p = .65$
Gender							
Male	81	26.8	37	24.7	44	28.9	
Female	220	72.8	113	75.3	107	70.4	
Non-binary	1	0.4	-	-	1	0.7	$\chi^2_2 = 1.76$, $p = .42$
Origin of birth							
Switzerland	153	50.7	73	48.7	80	52.6	
Germany	132	43.7	70	46.7	62	40.8	
Other	17	5.6	7	5.6	10	6.6	$\chi^2_3 = 1.11$, $p = .77$
Marital Status							
Single	184	60.9	98	65.3	86	56.6	
Married	89	29.5	36	24.0	53	34.9	
Divorced/widowed	24	8.0	13	8.7	11	7.2	
Other	5	1.6	3	2.0	2	1.3	$\chi^2_3 = 4.38$, $p = .22$
Education							
Less than High school	5	1.7	3	2.0	2	1.3	
High school diploma	60	19.9	25	16.7	35	23.0	
University	178	58.9	91	60.7	87	57.2	
Apprenticeship	59	19.5	31	20.7	28	18.4	$\chi^2_2 = 2.06$, $p = .36$
Employment							
Full-time paid work	66	21.9	37	24.7	29	19.1	
Part-time paid work	115	38.1	52	34.7	63	41.4	
Unemployed	20	6.6	9	6.0	11	7.2	
Student	80	26.5	40	26.7	40	26.3	
At-home Parent	5	1.6	4	2.7	1	0.7	
Retired	16	5.3	8	5.3	8	5.3	$\chi^2_5 = 4.01$, $p = .55$
Current psychological treatment	93	30.8	47	31.3	46	30.3	$\chi^2_1 = 0.04$, $p = .84$
Current medication	64	21.2	29	19.3	35	23.0	$\chi^2_1 = 0.61$, $p = .43$

Table 2. Observed means and standard deviations of depressive symptoms (PHQ-9) and working alliance (WAI-I).

	Pre-treatment		Early-treatment		Post-treatment	
Measure	Guided (n = 150)	Unguided (n = 152)	Guided (n = 128)	Unguided (n = 127)	Guided (n = 111)	Unguided (n = 97)
	M (*SD*)	M (*SD*)	M (*SD*)	M (*SD*)	M (*SD*)	M (*SD*)
PHQ-9	9.43 (3.75)	8.97 (3.94)	8.18 (3.31)	8.13 (4.28)	6.71 (3.85)	7.73 (5.14)
WAI-I						
Total			3.27 (0.73)	2.96 (0.75)	3.62 (0.70)	3.14 (0.75)
Tasks			2.87 (0.86)	2.86 (0.80)	3.35 (0.91)	3.11 (0.85)
Goals			3.28 (0.75)	3.11 (0.81)	3.57 (0.76)	3.27 (0.76)
Bond			3.65 (1.03)	2.9 (1.09)	3.95 (0.92)	3.04 (1.24)

Note. Early-treatment = two weeks after treatment begin, post-treatment = eight weeks after treatment begin.

Table 3. Partial correlations between change in depressive symptoms (PHQ-9) and the total score and subscales of the working alliance (WAI-I).

Early-Treatment								
WAI-I	Total		Tasks		Goals		Bond	
	Guided	Unguided	Guided	Unguided	Guided	Unguided	Guided	Unguided
WAI-I								
Total								
Tasks	.83***	.82***						
Goals	.87***	.81***	.78***	.72***				
Bond	.75***	.81***	.31**	.40***	.43***	.40***		
PHQ-Change	.16*	.26**	.27**	.22*	.15	.25*	.00	.19
Post-Treatment								
WAI-I								
Total								
Tasks	.87***	.78***						
Goals	.86***	.83***	.78***	.81***				
Bond	.72***	.75***	.35***	.22*	.38***	.31**		
PHQ-Change	.34***	.23*	.44***	.24*	.34***	.24*	.07	.10

Note. Early-treatment = two weeks after treatment begin, post-treatment = eight weeks after treatment begin. Pre-treatment depression scores were controlled for. The change in depressive symptoms was calculated as the subtract of pre-treatment and post-treatment scores.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4. Fit-Indices for mediation models.

Mediator	CFI	SRMR	RMSEA
WAI-I (early-treatment)			
Total Score	.96	.06	.07
WAI-I Tasks	.98	.04	.05
WAI-I Goals	.98	.06	.04
WAI-I Bond	.98	.05	.04
WAI-I (post-treatment)			
Total Score	.97	.06	.05
WAI-I Tasks	.99	.05	.04
WAI-I Goals	.99	.05	.03
WAI-I Bond	.99	.05	.04

Table 5. Total effects, overall direct effects, and overall indirect effects of group assignment (guided/unguided) on post-treatment depressive symptoms through early-treatment working alliance.

Mediator	Total effect		Direct effect		Indirect effect	
	Std. Est.	Unstd. Est. [95% CI]	Std. Est.	Unstd. Est. [95% CI]	Std. Est.	Unstd. Est. [95% CI]
WAI-I total score	−.136*	−.150 [−.309, −.012]	−.108	−.120 [−.258, .020]	−.028*	−.031 [−.092, −.001]
WAI-I subscales						
Tasks	−.130*	−.143 [−.296, −.006]	−.128*	−.141 [−.280, −.005]	−.002	−.002 [−.050, .033]
Goals	−.134*	−.150 [−.289, −.015]	−.104	−.115 [−.248, .017]	−.031*	−.034 [−.100, −.006]
Bond	−.127*	−.140 [−.293, −.007]	−.086	−.094 [−.251, .038]	−.041	−.045 [−.111, .002]

Note. The significance (*) of the estimates was tested using the bootstrapped bias-corrected 95% CI. Std. Est. = standardized estimate; Unstd. Est. = unstandardized estimate; CI = confidence interval. The model is corrected for the depression score at pre-treatment. The independent dichotomous variable was group assignment (guided/unguided) and the dependent variable was depressive symptoms (PHQ-9) at post-treatment.

Table 6. Total effects, overall direct effects, and overall indirect effects of group assignment (guided/unguided) on post-treatment depressive symptoms through post-treatment working alliance.

Mediator	Total effect		Direct effect		Indirect effect	
	Std. Est.	Unstd. Est. [95% CI]	Std. Est.	Unstd. Est. [95% CI]	Std. Est.	Unstd. Est. [95% CI]
WAI-I total score	−.115	−.126 [−.275, .006]	−.062	−.068 [−.213, .082]	−.053*	−.058 [−.120, −.017]
WAI-I subscales						
Tasks	−.128*	−.139 [−.284, −.011]	−.077	−.083 [−.224, .052]	−.051*	−.056 [−.125, −.017]
Goals	−.111	−.121 [−.272, .017]	−.059	−.064 [−.221, .087]	−.052*	−.057 [−.133, −.012]
Bond	−.108	−.119 [−.269, .025]	−.095	−.104 [−.263, .054]	−.014	−.015 [−.058, .008]

Note. The significance (*) of the estimates was tested using the bootstrapped bias-corrected 95% CI. Std. Est. = standardized estimate; Unstd. Est. = unstandardized estimate; CI = confidence interval. The model is corrected

for the depression score at pre-treatment and the working alliance score at early-treatment. The independent dichotomous variable was group assignment (guided/unguided) and the dependent variable was depressive symptoms (PHQ-9) at post-treatment.

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Erklärung zur Dissertation

Hiermit bestätige ich, dass ich die Dissertation

Optimizing the Supportive Context of Web-Based Self-Help in Individuals With Mild to Moderate Depressive Symptoms

im Fach klinische Psychologie und Psychotherapie

unter der Leitung von Prof. Dr. phil. Thomas Berger

ohne unerlaubte Hilfe ausgeführt und an keiner anderen Universität zur Erlangung eines akademischen Grades eingereicht habe.

Datum 13.09.2022 Unterschrift