Editorial
Should we use more Digital Therapy in Clinical Practice?

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The short answer to our initial question is: We do not know yet, but we should be positive and open minded towards digital technologies in psychological therapy, because they are a powerful instrument to treat over a larger distance, and employ new possibilities and techniques in the therapeutic process. We should have a closer look on efficacy, safety and acceptance (in patients and clinicians) of digital therapy solutions. Both, patients and clinicians face new challenges ranging from data protection issues to unfamiliar therapeutic settings. Clinicians should know the limits of digital therapy and authorities should invest in digitalization of psychotherapeutic interventions. From our perspective, three digital therapeutic settings will fundamentally influence the psychological therapy in future: (1) Internet-based therapy, (2) smartphone-based therapy and (3) Virtual Reality applications. A substantial part of the published studies in the field failed to report side effects, adverse events, and other safety problems – the latter being a problem in psychological therapies per se. Only few studies report these data for specific applications (e.g. Boettcher et al., 2014). Most studies focus solely on the efficacy of the treatment, therefore we illustrate some current reviews in the present editorial and new developments indicating efficacy and promising results of digital therapies.

Internet-based therapy

Meta-studies regarding Internet-based therapy show heterogeneous outcomes. Some reviews found that Internet-based interventions are effective in reducing the incidence of depression and decreasing anxiety symptoms in adolescents and adults (e.g. Etzelmueller et al., 2020; Reins et al., 2021). This is contradicted by other reviews, which found only small effects in preventing depression (e.g. Rigabert et al., 2020). However, a recent review showed that telehealth applications and Internet-based therapy are useful tools in treating social anxiety (Andersson et al., 2014), post-traumatic stress disorder (PTSD) (Kuhn & Owen, 2020), and first RCTs show promising results of Internet-based therapy in individuals with obsessive-compulsive disorder (Schröder et al., 2020).

Smartphone-based therapy

The use of smartphones devices for mental health purposes is rapidly growing, but especially for unguided apps there is a definite lack of evidence. Current meta-analyses suggest moderate effects in the treatment of depressive symptoms, nicotine addiction and social anxiety symptoms; but smartphone treatments seem to have only limited efficacy in treating general anxiety, PTSD, or suicidality (Goreis et al., 2020; Linardon et al., 2019; Weisel et al., 2019). Results for prodromal and early course psychotic symptoms were highly heterogeneous (Camacho et al., 2019). Moreover, a high drop-out rate is reported for smartphone therapies (e.g. Torous et al., 2020).

Table of Contents

Virtual Reality therapy

Virtual Reality has been proven to be an efficient tool for exposure therapy in anxiety disorders with comparable effects to in-vivo exposure (Carl et al., 2019). Moreover, Virtual Reality exposure therapy seems to be a promising therapeutic approach for the treatment of PTSD (Kothgassner et al., 2019). However, only few studies are carried out including children and adolescents (Kothgassner et al., in press). Nevertheless, Virtual Reality is also used in the therapy of people with mild cognitive impairment and dementia, but has only limited efficacy (Kim, Pang & Kim, 2019). An innovative approach was used in the treatment of psychosis: an RCT by Pot-Kolder et al. (2018) showed that virtual cognitive behavioral therapy succeeds to reduce paranoid ideations and anxiety; further data suggest that Virtual Reality is a safe treatment for people suffering from psychosis.

Outlook

Concluding, there is a growing body of literature on psychological treatments using digital applications, the majority of them seem to have moderate to high efficacy. Many studies compare digital treatments with real-life treatments and demonstrate the advantages of digital therapy. Future RCTs should increasingly focus on researching the safety of treatments and hurdles of using digital technologies in a clinical practice setting. Further, it is important to understand the effect of therapeutic guidance in digital therapies because the specific effect of guidance remains unclear. Some authors argue (Reins et al., 2021) that guided therapies are convenient for severe psychopathologies (e.g. major depression), but may have only a limited effect on the efficacy of subthreshold mental disorders.

Digital therapy took an important role during the pandemic crisis in 2020 and continues to do so. As such it could be a critical augmentation for face-to-face social interactions in rural areas or if social contact is no longer possible (e.g. quarantine measures). A still existing hurdle in many countries is the legalization of Internet-based therapy; in Austria and Germany, for instance, psychological and psychotherapeutic services may not be delivered exclusively online, only counselling activities are allowed using the Internet (see Kothgassner & Felnhofer, 2018). In sum, the efficacy and safety of these digital interventions have to be investigated, and clinicians have to be trained in the usage of these technologies as well as with regards to the requirements of digital therapy approaches before implementing these applications in clinical practice.

In this issue, we ask experts in the field of internet-based therapy on their opinion and expertise regarding this important topic. The urge for digital treatment methods will last after the pandemic and it is important to start implementation, structural planning and specific guidelines for this period. Therefore, *Digital Psychology* will foster empirical submissions and reviews about efficacy and side effects of innovative digital therapies, as well as case studies of digital interventions. In the current issue – two case studies are presented for an acute internet-based assessment and intervention during the first week of the COVID-19 crisis (Klinger, 2021) and a VR-intervention for blood and injection phobia (Lanzinger et al., 2021). We wish you a pleasant read.

Oswald D. Kothgassner and Anna Felnhofer
Editors-in-Chief

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Conflict of Interest

OK and AF declare no conflict of interest.

Expert Views on …

… Online Therapy

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[DP] How would you define online therapy?

Thomas Berger: Defining online therapy can be difficult as there are different conceptualizations and viewpoints. Moreover, many terms have been used to describe therapeutic activities conducted online, such as internet-delivered therapy, web-based treatments, online interventions, or internet-delivered cognitive behavioral therapy (iCBT). Because the internet can be used for various activities, such as communicating with the client and providing information, there are different forms of online therapy, and it is not always clear what is meant by which term.

Generally, internet approaches to psychotherapy can be divided according to various criteria, such as therapist involvement, communication mode, therapeutic approach, and the combination with in-person therapy. For instance, there are online therapies such as e-mail, chat, or video-conferencing therapies, in which the internet is used as a communication medium between the therapist and the patient, unguided and guided treatments in which the main component is a self-help program or smartphone app, and blended treatments, the combination of in-person therapy and online interventions. Finally, we should not forget that the internet is mainly a medium for content delivery. Thus, internet-delivered treatments differ concerning the therapeutic approach and content on which treatment is based. The majority of research and implementations have focused on iCBT.

[DP] Why use digital media in the context of therapy?

Johanna Boettcher: There are several good reasons to use digital media. Maybe we should differentiate between using media as a supplement to face-to-face therapy or as a substitute. Adding digital media to face-to-face therapy facilitates homework and promotes learning in daily life. For example, a patient using a mood tracking app is able to record mood swings in the situations they occur. This can help patients and therapists identify patterns they might want to address in session.

Using digital media instead of face-to-face therapy holds different advantages. These are mainly overcoming organizational barriers such as constraints of time and location, difficulties to access therapy, as well as limited psychotherapist resources. For some patients, accessing online therapy is also easier because of the reduced stigma and fear of judgment. Many patients still fear the stigma associated with mental health treatment.

[DP] Are there any contraindications for online therapy?

Johanna Boettcher: Not any that can be identified in our data. Some might assume that digital interventions are not suitable for older patients or are less beneficial for patients with lower levels of education. However, data does not show this. In fact, when we think of age, we tend to see an opposite trend, with some studies reporting that older patients adhere better to online treatments. Another common prejudice regarding online treatments is that they are made for patients with mild symptoms. Severely impaired patients or even patients with co-morbid personality disorders will not benefit. This is not true. Studies examining symptom severity as a predictor of outcome replicate the pattern found in face-to-face therapy. High initial symptom severity is associated with lower end-state functioning but with comparable rates of improvement. Regarding personality disorders, too few studies investigated them as a predictor of outcome.

However, my own clinical impression is that it seems easier for some patients with difficult interaction styles to communicate asynchronously online. Also, the format seems to help them to concentrate more on the content and the specific interventions of the therapy.

With all this said, we should keep in mind that most forms of psychotherapy are somewhat exclusive. While internet interventions might help us reach patients who went unnoticed before, they naturally exclude other groups, such as the illiterate or those not accessing the internet.

[DP] An often voiced critique from therapists is that the "human factor" is missing online. Is this a valid objection?

Thomas Berger: It is a valid critique if the human factor is actually missing in an internet-delivered treatment. I believe that the human factor is just as important in online therapies as in face-to-face therapies and that this human factor, just as in face-to-face therapies, can be realized in a better or a worse way. This is not only true for video-conferencing therapies, which can be associated with a good or bad therapeutic alliance. Even unguided self-help programs can be written and designed more or less human and touching, just as novels can be more or less moving. Research shows that the therapeutic relationship can be established in various forms of online therapy. Moreover, there is an important research line on internet interventions focusing on the degree of human support and guidance required to be

effective during unguided self-help interventions. The current literature suggests that unguided internet interventions with no human support at any stage tend to be associated with higher dropout rates, lower adherence, and also lower effects than treatments including human support. Thus, therapists also seem to play an essential role in online treatments.

[DP] From a practical perspective, what are the key challenges in online therapy?

Thomas Berger: Probably the most critical challenge is data privacy and security. As we all know, internet-based communication is never completely secure, even if we take all known measures to secure data and preserve confidentiality. The question, then, is whether we accept some risks concerning data protection in exchange for other benefits such as increased access to therapeutic services. During the corona pandemic lockdown, many patients and therapists accepted some data security risks because there was no other solution than online therapy. However, discussions on the balancing of risks and opportunities have rarely been conducted so far. Rather, stakeholders and providers tend to pretend that there can be 100% security.

A second challenge has to do with the dissemination and implementation of evidence-based online treatments. Despite the extensive body of research and potential benefits of internet-delivered interventions, the actual use and implementation of evidence-based internet interventions into routine care lag behind the possibilities. The implementation of internet interventions, which is likely to move forward in the next few years, should also take ethical aspects into account. For example, it must be ensured that the implementation is not simply a secondary financial interest of program developers and providers but is significantly driven by patients' interests and scientific findings. It is also important to ensure that new technical solutions do not exacerbate inequities in the health care system. For example, it should be ensured that everyone has access to the new technical solutions and can choose whether they want this or would prefer to be treated conventionally.

[DP] From a scientific perspective, what are the key challenges in online therapy?

Johanna Boettcher: Well, in general, online interventions are a psychotherapy researcher's dream. Large sample sizes, repeated assessments, getting insight into therapy content, all more easily realized in digital interventions. This, in addition with a lot of enthusiasm, explains why research on digital interventions drew level with traditional psychotherapy research so quickly. Now, both fields are facing the same scientific challenges. From my point of view these are mainly improving patient-intervention fit and understanding the mechanisms of change. But there are, of course, a million other interesting questions regarding psychotherapy in general, whether delivered face-to-face, online or in a blended format.

[DP] Online therapy in 10 years – where are we heading?

Thomas Berger: Internet interventions are most likely here to stay and will hopefully increase client access to evidence-based psychological treatment. The blending of internet and face-to-face therapies will become very common, and clinicians will work with face-to-face and internet interventions. I hope that in 10 years, people with mental health problems will have more options for getting professional help than today, including evidence-based unguided and guided self-help interventions, blended treatments, therapy via videoconferencing and e-mail, but also conventional face-to-face therapy. I also hope that internet-delivered treatments will improve current psychological treatments because, as Johanna said, internet studies make it possible to generate large enough samples to investigate mechanisms of change and isolate treatment components.

Johanna Boettcher: Online therapy in 2031? I agree with Thomas that online therapy is here to stay. In the future, artificial intelligence applications will become more important. Communication with chatbots will improve and will enliven programs and apps. Furthermore, analyzing data collected unobtrusively on phones and other devices will improve, patterns will be identified reliably and will inform the psychotherapeutic process. Programs will learn with their patients and will adapt to patient's characteristic behaviors. All this will make online interventions more efficacious, more parsimonious and more fun, but it will not substitute the human factor. We will still need psychotherapists caring for their patients, communicating with them online and in session.

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Linking the Technology Acceptance Model to Smartphone Use and Smartphone Use Disorder Tendencies: Results from a Survey Study

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Abstract

Background: Despite benefits resulting from smartphone use, evidence increasingly indicates that smartphone use may also have negative consequences, for example when smartphones are used in a disordered manner. One major concept in this research domain is problematic smartphone use or smartphone use disorder. However, factors influencing the emergence of adverse use are not yet fully understood.

Objective: The present study aimed to investigate cross-sectional predictive effects of acceptance of the smartphone, indicated by Technology Acceptance Model (TAM) variables, on smartphone use and tendencies towards smartphone use disorder.

Methods: An online survey with N=693 smartphone users (n=327 men, n=366 women, M_{age}=30.61, SD_{age}=14.98 years, range: 12–76 years) was conducted to study potential relationships. All participants completed a questionnaire assessing several TAM variables: perceived ease of use, perceived usefulness, and intention to use a smartphone in business and personal contexts. Moreover, participants provided information on their daily smartphone use (hours of daily use) for business and personal purposes, and completed a scale assessing tendencies towards smartphone use disorder. Structural equation modeling was used to analyze the data.

Results: The findings revealed that business use of the smartphone was not predicted by any TAM variable. Perceived usefulness positively predicted daily smartphone use in the personal context. All TAM variables in business and personal contexts positively predicted smartphone use disorder tendencies; at least via indirect effects.

Conclusion: Tendencies towards disordered smartphone use seem to be positively associated with acceptance of this technology with regard to its perceived ease of use, usefulness, and deliberate usage intentions. These findings expand knowledge of the new psychological phenomenon of smartphone use disorder tendencies.

Keywords: Technology Acceptance Model, TAM, Smartphone Use Disorder, Smartphone Use, Personal Use, Business Use

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1 Introduction

Presently, around 3.6 billion people use a smartphone for business and/or personal purposes worldwide (Newzoo (2019) as cited in Statista, 2020). Despite the potential benefits that may result from smartphone use (e.g., ease of communication, navigation support, and constant information accessibility), a growing number of scientists point to the "dark side" of the use of digital technology, including phenomena such as Internet addiction (Montag & Reuter, 2015), technostress (Riedl, 2013), and problematic smartphone use/smartphone use disorder (Lachmann et al., 2017). Given the potential negative effects of smartphone use on well-being, we aimed to further elaborate on the putative determinants of smartphone use and tendencies towards its disordered use.

Excessive use of the smartphone has been linked with impairments in mental health (Elhai et al., 2019, 2020), social interactions (Dwyer et al., 2018; Kushlev et al., 2019), and productivity (Rozgonjuk et al., 2020). Most questionnaires examining excessive smartphone use have adopted an addiction framework, hence, tested if excessive smartphone use falls into the category of addictive behaviors (Kwon, Lee, et al., 2013; Lin et al., 2014). But whether smartphone use can be "addictive" is still a matter of debate. Also, excessive use can be (mis)understood as merely

time-consuming use. While "addictive" use of the smartphone is positively associated with time spent on a smartphone, time-intensive use is not the same as "addictive" use (Loid et al., 2020; Rozgonjuk et al., 2018). "Addictive" use additionally includes symptoms such as negative consequences on the user's life. The potential negative consequences of digital technology use have also been outlined in the realm of Internet use disorder, and "addictive" use of the smartphone can be seen as a mobile version of Internet use disorder (Montag, Wegmann, et al., 2021; Pontes et al., 2015). However, new work by Elhai et al. (2020) highlights the difficulty in defining clear sets of symptoms which would help diagnose "addictive" use. Of note, we use the term "smartphone use disorder" instead of "smartphone addiction" from now on (see Supplementary Material 1).

The problems regarding clear symptoms of smartphone use disorder are also mirrored in smartphone use disorder not yet being considered an official diagnosis. Therefore, official diagnostic criteria for the condition are not available. For this reason, the present study applies the often-used addiction framework (Kwon, Lee, et al., 2013; Lin et al., 2014) to assess tendencies towards smartphone use disorder, but does not use a categorization involving disordered versus not disordered use. Instead, this work relies on a dimensional approach assessing "tendencies towards smartphone use disorder". This approach also prevents over-pathologizing everyday behaviors such as smartphone use (Billieux et al., 2015).

In order to understand technology use and tendencies towards its disordered use, one can investigate the extent of acceptance of such technologies. A positive attitude – i.e. acceptance of a technology – might reinforce use and may be associated with tendencies towards its disordered use. To investigate acceptance of the smartphone technology, we chose the Technology Acceptance Model (TAM) by Davis (1989). This model, in its basic form, predicts actual technology use by behavioral usage intentions for the technology. Behavioral intentions are influenced by attitudes towards technology use, shaped by perceived ease of use and perceived usefulness of the technology, whereby perceived ease of use influences perceived usefulness. This model is of great interest in the present study as many studies support the explanatory power of TAM (King & He, 2006; Lee et al., 2003; Legris et al., 2003). Several extensions and unifying frameworks of the initial TAM model exist, such as TAM2 (Venkatesh, 2000; Venkatesh & Davis, 2000) and Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003). These adaptions were developed to increase the model's predictive power. However, here we focus on the most basic TAM model including perceived ease of use, perceived usefulness, and usage intentions. This decision is based on several studies reporting that perceived ease of use and perceived usefulness positively predict intentions to use a smartphone (Cho & Park, 2014; Joo & Sang, 2013), positively predict self-reported actual use via usage intentions (Kim, 2008), and predict intention to purchase a smartphone (Rigopoulou et al., 2017). In line with these findings, another study found significant positive bivariate correlations for perceived ease of use and perceived usefulness with intention to continue using a smartphone (Park et al., 2013). TAM, importantly, aims to predict technology use in general without conceptualizing tendencies towards disordered use. We are only aware of one study, from South-Korea, relating the TAM variables perceived ease of use and perceived usefulness to smartphone use disorder tendencies. That study found that both TAM variables positively predicted smartphone use disorder tendencies (Park et al., 2013).

In light of the aforementioned literature, it can be assumed that TAM's perceived ease of use, perceived usefulness, and usage intentions are associated with self-reported time spent on the smartphone, and potentially smartphone use disorder tendencies. Given that the smartphone is a multipurpose device, which can be used in business/school/university and personal contexts, we aimed to investigate cross-sectional predictive effects of the aforementioned TAM variables on smartphone use (and disorder tendencies) in both contexts. Given the recent inconclusive results of studies on gender differences in technology acceptance and use of technologies such as the smartphone (Andone et al., 2016; Lachmann et al., 2017; Mitchell & Hussain, 2018; Peterka-Bonetta et al., 2019; Sindermann et al., 2020), as well as those examining associations for age with technology and smartphone use (Lachmann et al., 2017; Mitchell & Hussain, 2018; Peterka-Bonetta et al., 2019), age and gender were additionally included in the models (see Figure 1).

2 Methods

2.1 Sample

A total of *N*=720 participants completed the German language online survey on technology use and provided data for the project. As an incentive they received feedback on their personality scores and smartphone use (individual feedback was provided anonymously in comparison to the results of all other participants of the study; there was no way for participants to attribute results to other specific participants). The personality scale was assessed for another research purpose but this is not of direct relevance to this study. The study was implemented in the SurveyCoder tool (https://www.surveycoder.com/). It was advertised via various offline (e.g., TV, Radio) and online (e.g., social media) platforms and anyone who was at least 12 years old and had Internet access could participate. Therefore, the present sample is a convenience sample. After data cleaning (see Supplementary Material 1) data of a final sample size of *N*=693 (*n*=327 men, *n*=366 women) participants remained for analysis. The dataset has been uploaded to the Open Science Framework (https://osf.io/v23d7/).

2.2 Ethics

The study was approved by the local ethics committee of Ulm University, Ulm, Germany. All participants provided informed

electronic consent prior to participation. Participants between 12 and 18 years of age required consent from their parents or legal guardians prior to participation, which also had to be provided electronically. Therefore, adolescents were asked to inform their parents and to confirm their agreement by clicking a button.

2.3 Measures

Technology acceptance was assessed using perceived ease of use, perceived usefulness, as well as usage intentions and predicted usage with regard to smartphone use both for personal and business/university/school purposes (Sindermann et al., 2020). Of note, predicted usage was assessed for reasons of completeness, because it is one of the questionnaire's scales. However, of primary interest in this work are hours of daily smartphone use in business and personal contexts and tendencies towards smartphone use disorder as dependent variables. Additional results modeling predicted usage of the smartphone are presented in Supplementary Material 2. In total, the questionnaire consists of 9 items to assess perceived usefulness, 9 items to assess perceived ease of use, 2 items to assess usage intentions, and 4 items to assess predicted usage for both personal and business use of the smartphone (48 items in total). For each item, responses can range between "1 = does not apply at all" and "6 = does apply completely". Scale scores were calculated as means of the respective items. Internal consistency estimates (using Cronbach's alphas) for the scales were: smartphone business: .81 (perceived usefulness), .79 (perceived ease of use), .80 (usage intentions), and .86 (predicted usage); smartphone personal: .85 (perceived usefulness), .85 (perceived ease of use), .88 (usage intentions), and .92 (predicted usage).

Moreover, participants were asked to estimate how many hours per day (on average) they spent on their smartphone for both business/university/school and personal use in two separate items. These items were free response items to which participants could respond by inserting any positive number or zero.

Finally, the short version of the Smartphone Addiction Scale (SAS-SV) (Kwon, Kim, et al., 2013; Montag, 2018) was used to assess tendencies towards smartphone use disorder. It consists of 10 items and scores can range between 10 and 60, because each item is answered on a six-point Likert-scale from "1 = strongly disagree" to "6 = strongly agree". Internal consistency (using Cronbach's alpha) was .85 in the study sample.

2.4 Statistical Analysis

Statistical analyses were implemented in R version 3.5.2 (R Core Team, 2018) and R Studio version 1.1.463 (RStudio Team, 2015). Descriptive statistics, gender differences, and associations with age are presented in Supplementary Material 1 alongside correlational analyses of associations between TAM and smartphone use (disorder tendency) variables.

To investigate the main research questions, namely the associations of TAM variables with smartphone use (in hours) and tendencies towards smartphone use disorder, four structural equation models were calculated (see Figure 1 for an illustration of the general model). In separate models the dependent variable was either hours of daily smartphone use for business (predicted by the TAM variables in the business context) or personal purposes (predicted by the TAM variables in the personal context) or tendencies towards smartphone use disorder (predicted by the TAM variables in the business or personal con-

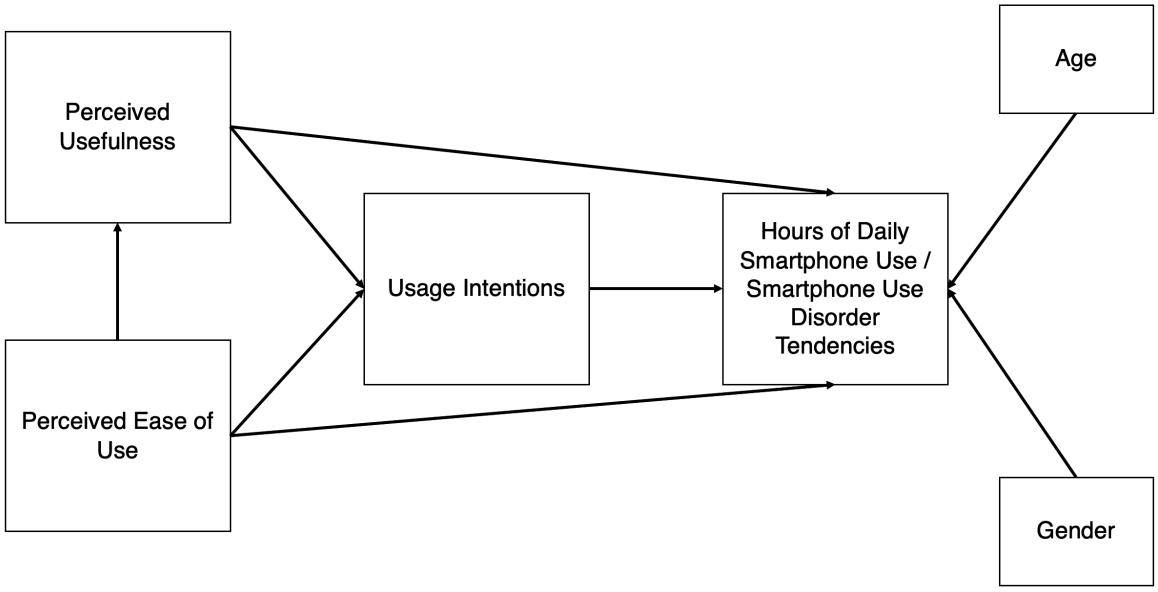

Figure 1. Model tested in the current study. Note that predicted usage was also assessed with the TAM questionnaire, but we chose to investigate hours of daily smartphone use / tendencies towards smartphone use disorder as relevant dependent variables in the main manuscript.

text). Hence, in two of the models, perceived ease of use, perceived usefulness, and usage intentions for business purposes as well as age and gender were specified to predict: i) self-reported hours of daily smartphone use for business purposes; or ii) SAS-SV scores. In the other models, perceived ease of use, perceived usefulness, and usage intentions for personal purposes as well as age and gender predicted: i) self-reported hours of daily smartphone use for personal purposes; or ii) SAS-SV scores. We did not integrate daily use and tendencies towards smartphone use disorder in one single model given the unknown causal association between the two. This allowed us to independently test the cross-sectional predictive effect of TAM variables on technology use and use disorder tendencies.

All variables were entered in the models as manifest variables. The lavaan package was used for these analyses (Rosseel, 2012).

3 Results

3.1 Sample

The sample consisted of *n*=327 men and *n*=366 women. The mean age of the sample was 30.61 years (*SD*=14.98), median age was 26 years, and participant age ranged from 12 to 76 years. Most participants reported a secondary school leaving certificate (*n*=147), A-level/High school diploma (*n*=158), or a university (including university of applied sciences) degree (*n*=280) as their highest educational degree. The remaining participants reported another type of school degree (streamed secondary school for lesser able students or vocational baccalaureate diploma) as highest educational degree (*n*=79) or no degree (*n*=29).

3.2 Structural Equation Models

Figures 2 to 5 show standardized estimates for path coefficients in the structural equation models. More detailed information on path coefficients can be found in Supplementary Material 2. Figure 2 shows the model on daily hours of smartphone use for business purposes. As can be seen in the Figure, none of the TAM variables were directly and significantly associated with hours of daily smartphone use for business purposes. Also, none of the indirect or total effects of TAM variables were significant.

Figure 3 presents the model on daily hours of smartphone use for personal purposes. Of TAM variables, only perceived usefulness was significantly and directly associated with hours of daily smartphone use for personal purposes (c1=0.13, p=.004). In line with this, the indirect effect of perceived ease of use via perceived usefulness (standardized estimate = 0.08, p=.005), the total effect of perceived usefulness (standardized estimate = 0.12, p=.004), as well as the total effect of perceived ease of use (standardized estimate = 0.07, p=.048) were significant.

Figure 4 shows the model on SAS-SV scores and perceived ease of use, perceived usefulness, and usage intentions for business purposes. Of the TAM variables, usage intentions (b1=0.23, p<.001) as well as perceived usefulness (c1=0.10, p=.028) were significantly and directly associated with SAS-SV scores. Additionally, all indirect effects as well as total effects were significant: indirect effect of perceived ease of use via perceived usefulness (standardized estimate = 0.06, p=.029); indirect effect of perceived ease of use via perceived usefulness and usage intentions (standardized estimate = 0.05, p<.001); indirect effect of perceived usefulness via usage intentions (standardized estimate = 0.09, p<.001); indirect effect of perceived ease of use via usage

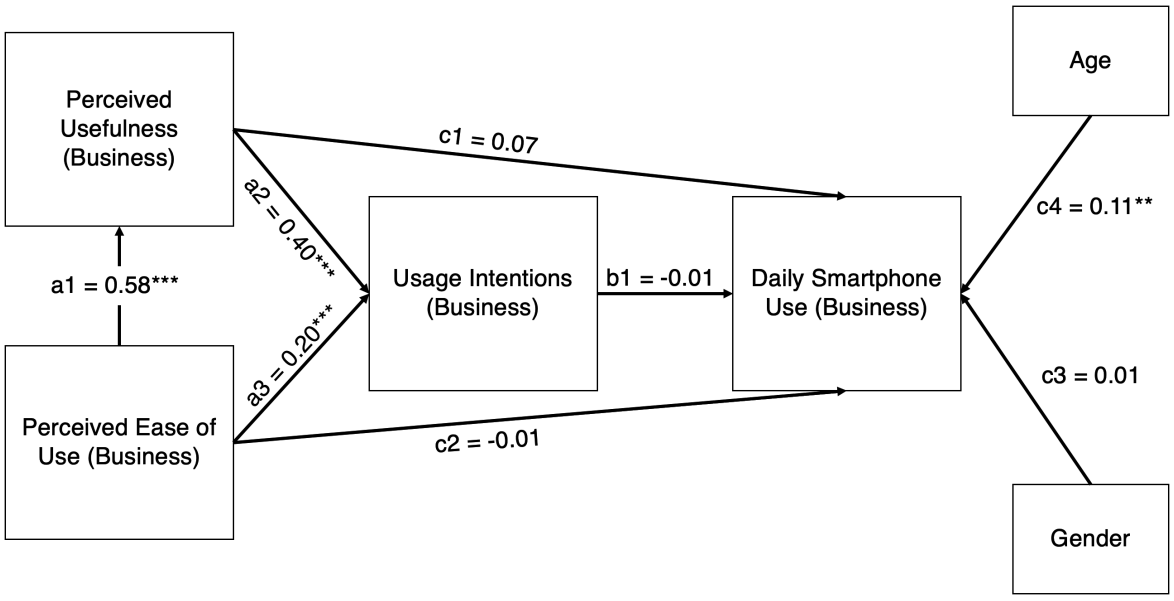

Figure 2. Model to predict daily hours of smartphone use for business purposes by TAM perceived ease of use, perceived usefulness, and usage intentions for business purposes; all estimates of path coefficients are standardized; gender: 0 = men, 1 = women, *p<.05, **p<.01, ***p<.001; Fit indices: Root Mean Square Error of Approximation (RMSEA) = 0.037, Comparative Fit Index (CFI) = 0.993, Tucker-Lewis Index (TLI) = 0.978, Standardized Root Mean Square Residual (SRMR) = 0.017.

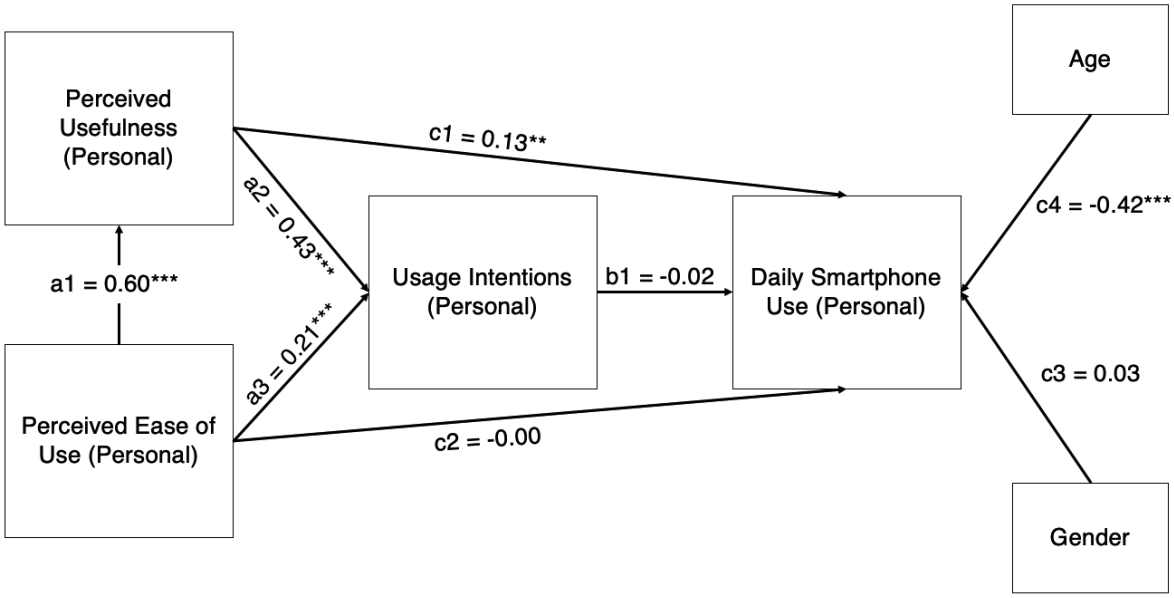

Figure 3. Model to predict daily hours of smartphone use for personal purposes by TAM perceived ease of use, perceived usefulness, and usage intentions for personal purposes; all estimates of path coefficients are standardized; gender: 0 = men, 1 = women, *p<.05, **p<.01, ***p<.001; Fit indices: Root Mean Square Error of Approximation (RMSEA) = 0.087, Comparative Fit Index (CFI) = 0.973, Tucker-Lewis Index (TLI) = 0.918, Standardized Root Mean Square Residual (SRMR) = 0.032.

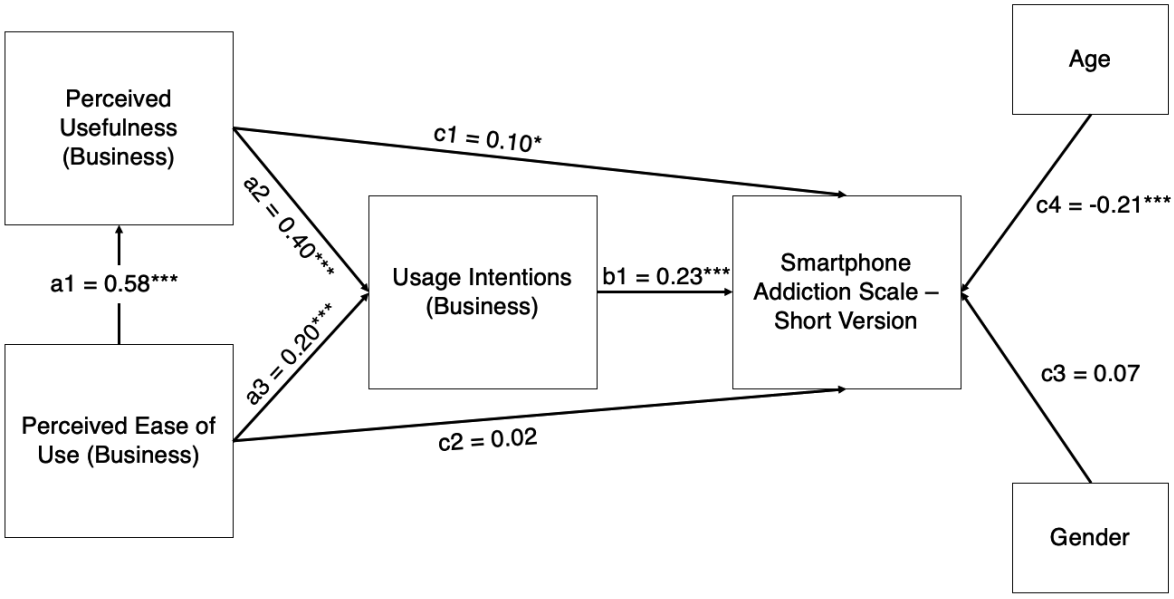

Figure 4. Model to predict Smartphone Addiction Scale – Short Version scores (assessing smartphone use disorder tendencies) by TAM perceived ease of use, perceived usefulness, and usage intentions for business purposes; all estimates of path coefficients are standardized; gender: 0 = men, 1 = women, *p<.05, **p<.01, ***p<.001; Fit Indices: Root Mean Square Error of Approximation (RMSEA) = 0.037, Comparative Fit Index (CFI) = 0.994, Tucker-Lewis Index (TLI) = 0.982, Standardized Root Mean Square Residual (SRMR) = 0.018.

intentions (standardized estimate = 0.05, p<.001); total effect of perceived ease of use (standardized estimate = 0.18, p<.001); total effect of perceived usefulness (standardized estimate = 0.19, p<.001).

In Figure 5, the associations between perceived ease of use, perceived usefulness, and usage intentions for personal purposes and SAS-SV scores are displayed. Of the TAM variables, usage intentions (b1=0.19, p<.001) and perceived usefulness (c1=0.13, p=.007) were significantly and directly linked to SAS-SV scores. Moreover, all indirect and total effects were significant: indirect effect of perceived ease of use via perceived usefulness (standardized estimate = 0.08, p=.008); indirect effect of perceived ease of use via perceived usefulness and usage intentions (standardized estimate = 0.05, p<.001); indirect effect of perceived usefulness via usage intentions (standardized estimate = 0.08, p<.001); indirect effect of perceived ease of use via usage

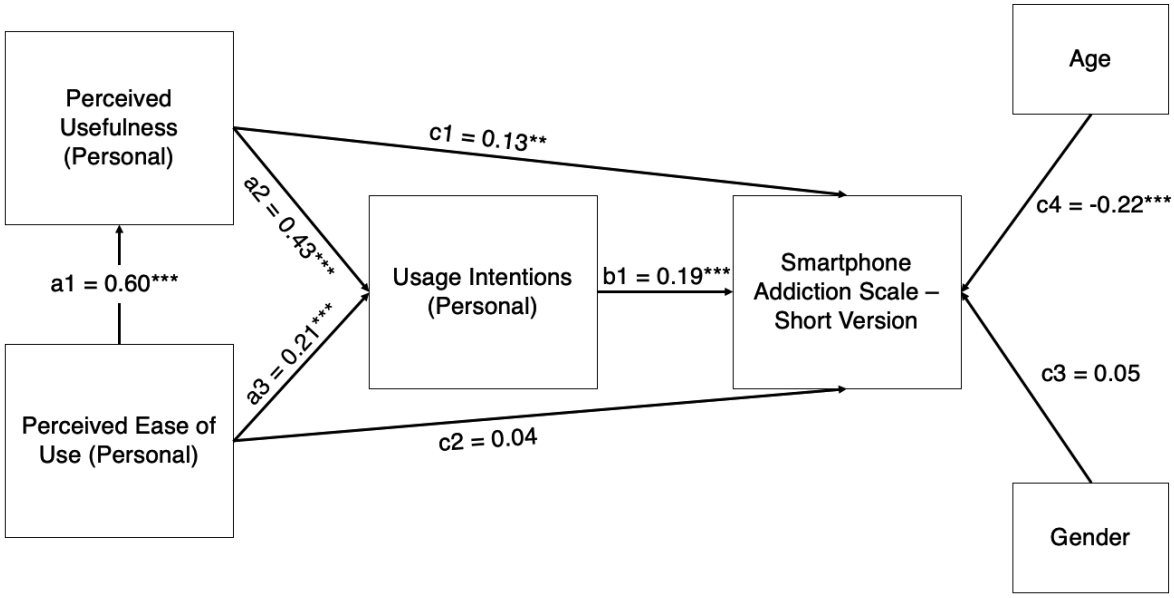

Figure 5. Model to predict Smartphone Addiction Scale – Short Version scores (assessing smartphone use disorder tendencies) by TAM perceived ease of use, perceived usefulness, and usage intentions for personal purposes; all estimates of path coefficients are standardized; gender: 0 = men, 1 = women, **p*<.05, ***p*<.01, ****p*<.001; Root Mean Square Error of Approximation (RMSEA) = 0.087, Comparative Fit Index (CFI) = 0.971, Tucker-Lewis Index (TLI) = 0.912, Standardized Root Mean Square Residual (SRMR) = 0.032.

intentions (standardized estimate = 0.04, *p*=.001); total effect of perceived ease of use (standardized estimate = 0.21, *p*<.001); total effect of perceived usefulness (standardized estimate = 0.21, *p*<.001).

Given the few restrictions in the models tested, the fit indices were, unsurprisingly, all quite good (e.g., all Comparative Fit Indices > 0.95 (Hu & Bentler, 1999)).

4 Discussion

The main goal of this work was to develop an understanding of the relationship between major components of TAM (perceived ease of use, perceived usefulness, usage intentions) and use of the smartphone (daily usage hours) and tendencies towards smartphone use disorder. The aim was to attain a greater comprehension of important determinants of smartphone use and tendencies towards its disordered use.

Our results showed that daily use of the smartphone for business purposes was not cross-sectionally predicted by any of the TAM variables. Daily use of the smartphone for personal purposes was directly cross-sectionally predicted by perceived usefulness and some paths including this variable. Regarding tendencies towards smartphone use disorder, we found that nearly all TAM variables – except for the direct effect of perceived ease of use – significantly cross-sectionally predicted SAS-SV scores, in both business and personal use contexts.

Regarding time spent using the smartphone per day, our data indicate that acceptance of the device does not explain its use in the business context. A possible reason is that business use is not dependent only on one's own acceptance of technology, but also on many other (external) factors which may exert influence. As such, regulations of the employer might be of importance. Examples are regulations about which apps to use for communication in the team and when and how long to be available via the smartphone. This is underlined by a study reporting positive associations between smartphone use and expectations of one's supervisor and norms of colleagues (Derks & Bakker, 2014).

Moreover, our data showed that time spent on a smartphone for personal purposes is primarily associated with perceived usefulness, indicating that higher smartphone use is due to a positive attitude towards its usefulness to execute personal tasks (e.g., to contact friends). Interestingly, usage intentions did not significantly affect daily personal use of the smartphone. This might be due to the fact that the smartphone is often not used with a specific and clearly stated intention or purpose, but rather constitutes a habitual behavior integrated in everyday life. Moreover, the lack of influence of usage intentions on daily personal use could also be explained by the fact that social media providers use mechanisms to keep users on the platform or get them back to the platform when they are not online. Such mechanisms comprise, among others, push-notifications, endless scrolling and streaming, and the personalized news feed (Montag, Lachmann, et al., 2019). Since social media use accounts for a substantial portion of time spent on a smartphone (Montag, Błaszkiewicz, Sariyska, et al., 2015), such external mechanisms might further drive smartphone use (especially for personal purposes) without a subjective intention to use it.

Moreover, our data showed that perceived usefulness of a smartphone for both personal and business purposes and perceived ease of smartphone use (see indirect effects and results of correlational analyses presented in Supplementary Material 1), alongside higher usage intentions, are associated with smartphone use disorder tendencies. Putatively, the higher perceived ease of use, perceived usefulness, and usage intentions lead to an increasing focus on the smartphone and ultimately tendencies towards its disordered use and thus smartphone-related negative impacts on one's life. The positive associations found between all TAM variables and tendencies towards smartphone use disorder in comparison to i) no significant predictive effect when investigating time spent on the smartphone for business purposes; and ii) only perceived usefulness as an important direct factor to predict time spent on the smartphone for personal purposes, is remarkable. This finding might indicate that for individuals with higher smartphone use disorder tendencies the smartphone plays a pivotal role. This importance, in turn, seems to be mirrored in a positive attitude and acceptance of various aspects of the smartphone, such as perceived ease of use and perceived usefulness as well as deliberate usage intentions. The mere use of the smartphone, however, does not seem to be reflected in a positive attitude, i.e. high acceptance, with regard to many TAM variables. Finally, positive associations found between TAM and smartphone use disorder tendencies are in line with prior work investigating perceived ease of use and perceived usefulness in association with tendencies towards smartphone use disorder (Park et al., 2013).

When interpreting our results, one should consider the following *limitations*, which deserve attention in future research. Firstly, we did not collect data on objectively measured usage behavior, but instead measured participants' usage intentions and self-reported time spent on the smartphone. Particularly with regard to the latter, studies have shown that these estimations may be biased (Montag, Błaszkiewicz, Lachmann, et al., 2015). Such biased reporting might in part explain why TAM variables rarely explained daily smartphone use. As a starting point for future studies, researchers could draw upon the work by Devaraj et al. (2008), which examined the actual use of a collaborative technology based on activity log files; see also Ryding and Kuss (2020) for a review. Secondly, the data presented in this paper are cross-sectional. What follows is that interpretations of causality patterns must remain speculative and therefore call for future longitudinal studies. Thirdly, another limitation that opens up potential for future research is that major outcome variables, such as depression (Elhai et al., 2019), burnout (Derks & Bakker, 2014), or stress (Vahedi & Saiphoo, 2018) were not included in this study. Moreover, one needs to take into account that smartphone use disorder is not yet an official diagnosis. Therefore, for now there is no consensus on diagnostic criteria and measures to assess the construct or tendencies towards this potential use disorder (i.e., a "gold standard"). Lastly, overall the study sample displayed rather low SAS-SV scores, limiting the generalizability of the results to more severely affected groups with regard to (tendencies towards) smartphone use disorder. However, considering that the rather low SAS-SV scores already showed remarkable associations with TAM variables, it is likely that higher SAS-SV scores would result even in higher correlations with TAM variables. Future empirical research should test this proposition.

In conclusion, this study helps to explain how the prominent TAM and its variables might be linked to smartphone use and smartphone use disorder tendencies. Specifically, tendencies towards smartphone use disorder seem to be especially positively associated with perceived ease of use, perceived usefulness as well as deliberate usage intentions. Based on the existing research, scholars should investigate the exact (causal) relationship between technology acceptance beliefs (e.g., perceived usefulness, perceived ease of use), technology attitude, usage intentions, actual usage patterns, tendencies towards smartphone use disorder, and resulting consequences such as depression, burnout, or stress.

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Declaration of Interest

Outside the scope of the present paper, Dr. Jon Elhai notes that he receives royalties for several books published on posttraumatic stress disorder (PTSD); is a paid, full-time faculty member at University of Toledo; is a paid, visiting scientist at Tianjin Normal University; occasionally serves as a paid, expert witness on PTSD legal cases; and receives grant research funding from the U.S. National Institutes of Health. Dr. Montag mentions that he has received (to Ulm University and earlier University of Bonn) grants from agencies such as the German Research Foundation (DFG). Dr. Montag has performed grant reviews for several agencies; has edited journal sections and articles; has given academic lectures in clinical or scientific venues or companies; and has generated books or book chapters for publishers of mental health texts. For some of these activities he received royalties, but not from the gaming or social media industry. Dr. Montag mentions that he is part of a discussion circle (Digitalität und Verantwortung: https://about.fb.com/de/news/h/gespraechskreis-digitalitaet-und-verantwortung/) debating ethical questions linked to social media, digitalization and society/democracy at Facebook. In this context, he receives no salary for his activities. Finally, he mentions that he currently functions as independent scientist on the scientific advisory board of the Nymphenburg group. This activity is financially compensated.

All authors declare that they do not have any conflicting interests.

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None

Supplementary Material 1

Smartphone use disorder terminology

The term "smartphone use disorder" is chosen in response to the inclusion of Gaming Disorder in the WHO's ICD-11 (Montag, Schivinski, et al., 2019; Montag, Wegmann, et al., 2021; Pontes et al., 2019; World Health Organization, 2019) and in line with the I-PACE model of specific Internet use disorders by Brand et al. (2016). Moreover, this term is used to strive for unification in the nomenclature in line with our previous works (e.g., Marengo et al., 2020). Note that "problematic smartphone use" or "smartphone addiction" are also terms used in previous publications to describe the same construct (Duke & Montag, 2017; Elhai et al., 2019; Herrero et al., 2017; Mitchell & Hussain, 2018).

Additional information on methods

Data cleaning

Of the N=720 participants, n=4 participants were excluded for being younger than 12 years old or implausibly old (older than 1,000 years). Additionally, n=11 participants were excluded because they reported more than 16 hours of daily smartphone use (personal and business use combined). We chose 16 hours as the criterion because, given an estimated sleeping time of 8 hours, 16 hours of time awake remain per day. Lastly, participants denying smartphone ownership (n=7) as well as individuals reporting the use of the smartphone for 0 hours for both private and business use (n=5) were excluded because we were specifically interested in smartphone use. No missing data were observed.

Finally, it is important to mention that the present sample partly overlaps with samples of other studies investigated in light of other research questions by the authors. More detailed information can be requested from the authors.

Additional analyses and results

Descriptive statistics, gender differences, and associations with age

First, skewness and kurtosis of all variable distributions were checked. Only the distributions of variables on hours of daily smartphone use showed a skewness and kurtosis exceeding +/- 1 (business: skewness=3.36, kurtosis=18.05; personal: skewness=1.39, kurtosis=2.24). According to guidelines by Miles and Shevlin (2001), normality cannot be assumed for these two variables. Therefore, when investigating these two variables, non-parametric statistical analyses were chosen. When investigating the other variables, parametric tests were used.

Descriptive statistics were calculated and associations with gender and age were investigated. Gender differences were tested for significance by means of t-tests (Welch's t-tests were used if necessary) or Mann-Whitney U-tests (for daily smartphone use variables). Associations with age were investigated applying Pearson or Spearman (for daily smartphone use variables) correlations.

Descriptive statistics of TAM and smartphone use (disorder tendency) variables for the total sample and for men and women are presented in Supplementary Table S1. Significant gender differences were found in perceived ease of use ($t(691)=2.62$, $p=.009$, Cohen's $d=.20$), perceived usefulness ($t(691)=2.52$, $p=.012$, Cohen's $d=.19$), and predicted usage ($t(691)=2.33$, $p=.020$, Cohen's $d=.18$) for business use of the smartphone. Men scored higher than women on all of these scales. Additionally, significant differences between men and women, with women scoring higher, were found on hours of daily smartphone use for personal purposes ($W=53{,}800.00$, $p=.019$, $r=-.09$) and SAS-SV scores ($t(691)=-2.11$, $p=.035$, Cohen's $d=-.16$).

Significant correlations with age were found for perceived ease of use ($r=-.09$, $p=.016$) for business use of the smartphone, intentions to use the smartphone for personal purposes ($r=.08$, $p=.028$), daily hours of smartphone use for business ($\rho=.18$, $p<.001$) and personal purposes ($\rho=-.49$, $p<.001$), as well as SAS-SV scores ($r=-.22$, $p<.001$). These findings support the decision to include gender and age in the structural equation models.

The partial correlation (corrected for age) between the two daily smartphone use variables (business and personal) was $\rho=.06$, $p=.105$. The correlation between daily business use and SAS-SV scores was $\rho=.10$, $p=.006$; between daily personal use and SAS-SV scores it was $\rho=.46$, $p<.001$.

Table S1. Descriptive statistics

	Total Sample (N=693)			Men (n=327)			Women (n=366)		
	Min	**Max**	**M (SD)**	**Min**	**Max**	**M (SD)**	**Min**	**Max**	**M (SD)**
TAM Business									
Perceived Ease of Use	1.22	5.89	4.09 (0.75)	1.44	5.67	4.17 (0.74)	1.22	5.89	4.02 (0.76)
Perceived Usefulness	1.00	5.89	3.51 (0.80)	1.00	5.89	3.59 (0.84)	1.00	5.56	3.43 (0.76)
Usage Intentions	1.00	6.00	4.56 (1.19)	1.00	6.00	4.58 (1.16)	1.00	6.00	4.55 (1.22)
Predicted Usage	1.00	6.00	2.97 (1.15)	1.00	6.00	3.07 (1.16)	1.00	6.00	2.87 (1.14)
TAM Personal									
Perceived Ease of Use	1.56	6.00	4.11 (0.84)	1.56	6.00	4.17 (0.84)	1.56	6.00	4.07 (0.84)
Perceived Usefulness	1.00	6.00	3.50 (0.87)	1.00	6.00	3.53 (0.92)	1.00	6.00	3.47 (0.83)
Usage Intentions	1.00	6.00	4.53 (1.25)	1.00	6.00	4.45 (1.26)	1.00	6.00	4.61 (1.23)
Predicted Usage	1.00	6.00	3.60 (1.26)	1.00	6.00	3.54 (1.21)	1.00	6.00	3.66 (1.30)
Daily Smartphone Use (Business)	0.00	10.00	0.82 (1.16)	0.00	9.00	0.83 (1.13)	0.00	10.00	0.81 (1.19)
Daily Smartphone Use (Personal)	0.00	12.00	3.01 (1.98)	0.00	12.00	2.85 (1.92)	1.00	12.00	3.16 (2.02)
SAS-SV score	10.00	60.00	27.60 (9.48)	10.00	60.00	26.80 (9.51)	10.00	53.00	28.32 (9.42)

Note. The two daily smartphone use variables were assessed in hours. Therefore, 0.82 hours corresponds to around 49 minutes, 3.01 hours corresponds to around 181 minutes (total sample); 0.83 hours correspond to around 50 minutes, 2.85 hours correspond to around 171 minutes (men); 0.81 hours correspond to around 49 minutes, and 3.16 hours correspond to 190 minutes (women). Tendencies towards smartphone use disorder were assessed with the SAS-SV: Smartphone Addiction Scale – Short Version.

Results of correlational analysis

Partial Pearson or Spearman (for the daily smartphone use variables) correlations were calculated (corrected for age) to investigate associations of TAM variables (perceived ease of use, perceived usefulness, usage intention, predicted usage for business and personal use) with daily smartphone use variables (business and personal, respectively) and SAS-SV scores. These correlations were calculated for the total sample as well as separately for men and women (see significant gender differences).

Supplementary Table S2 shows associations of TAM scales for business use of the smartphone with the daily smartphone use variable for business purposes. Supplementary Table S3 shows associations of TAM scales for personal use of the smartphone with the daily smartphone use variable for personal purposes. Supplementary Table S4 shows associations of the TAM scales for both business and personal use of the smartphone with SAS-SV scores. After Bonferroni correction for multiple testing (0.05/16=0.0031; for 16 correlations calculated (in each sample)), not all correlations remain significant.

Table S2. Partial correlations (corrected for age) of the TAM scales for business use with the smartphone use variable for business purposes

	Total Sample (N = 693)	Men (n = 327)	Women (n = 366)
Perceived Ease of Use	ρ=.04, ρ=.356	ρ=.06, ρ=.278	ρ=.03, ρ=.523
Perceived Usefulness	ρ=.10, ρ=.008	ρ=.09, ρ=.117	ρ=.14, ρ=.010
Usage Intention	ρ=.02, ρ=.629	ρ=.01, ρ=.800	ρ=.06, ρ=.285
Predicted Usage	ρ=.16, ρ<.001	ρ=.18, ρ=.001	ρ=.13, ρ=.013

Table S3. Partial correlations (corrected for age) of the TAM scales for personal use with the smartphone use variable for personal purposes

	Total Sample (N = 693)	Men (n = 327)	Women (n = 366)
Perceived Ease of Use	ρ=.11, ρ=.004	ρ=.02, ρ=.759	ρ=.21, ρ<.001
Perceived Usefulness	ρ=.16, ρ<.001	ρ=.10, ρ=.071	ρ=.24, ρ<.001
Usage Intention	ρ=.12, ρ=.002	ρ=.10, ρ=.074	ρ=.13, ρ=.010
Predicted Usage	ρ=.16, ρ<.001	ρ=.08, ρ=.167	ρ=.23, ρ<.001

Table S4. Partial correlations (corrected for age) of the TAM scales for business and personal use with the SAS-SV scores

	Total Sample (N = 693)	Men (n = 327)	Women (n = 366)
TAM Business			
Perceived Ease of Use	r=.17, p<.001	r=.12, p=.034	r=.24, p<.001
Perceived Usefulness	r=.23, p<.001	r=.14, p=.011	r=.33, p<.001
Usage Intention	r=.30, p<.001	r=.32, p<.001	r=.28, p<.001
Predicted Usage	r=.27, p<.001	r=.25, p<.001	r=.31, p<.001
TAM Personal			
Perceived Ease of Use	r=.21, p<.001	r=.15, p=.008	r=.27, p<.001
Perceived Usefulness	r=.26, p<.001	r=.20, p<.001	r=.33, p<.001
Usage Intention	r=.29, p<.001	r=.28, p<.001	r=.30, p<.001
Predicted Usage	r=.32, p<.001	r=.26, p<.001	r=.37, p<.001

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Internet-Based Psychological Assessment and Intervention During the COVID-19 Pandemic With an Adolescent Transgender Patient – A Case Report

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Abstract
In this report, a case of a 17,2-year-old male to female patient with gender dysphoria and autism spectrum disorder, who received an internet-based psychological assessment and intervention during the COVID-19-pandemic, is described. The patient started the assessment process in order to get medical treatment for gender dysphoria prior to the outbreak of the pandemic in Austria. As face-to-face appointments could no longer take place due to the government measures, the patient experienced significant distress and anxiety regarding her expected progress in the transition process. In order to reduce the distress of the patient an internet-based psychological assessment and intervention via Instahelp was offered, to which the patient gave consent. The patient found the intervention helpful, emphasizing that it helped her a lot to get through this difficult time with many uncertainties. The case study provides a good example of a possible transition for at least some parts of the face-to-face psychological assessment to internet-based assessment for similar situations in the future.

Keywords: gender dysphoria, autism spectrum disorder, psychological assessment, internet-based assessment, internet-based intervention

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1 Introduction

Gender dysphoria (GD) is defined by a marked incongruence between one's experienced/expressed gender and assigned gender. Adolescents with gender dysphoria experience significant distress regarding the gender they were assigned, which can result in rejection of their body (especially their sexual characteristics) and the expected roles of their assigned gender. Gender dysphoria often involves a strong desire to be of and /or treated as a gender other than one's assigned gender and includes a firm conviction that one has the typical reactions and feelings of a gender other than one's assigned gender (American Psychiatric Association, 2013; Nieder et al., 2014).

Autism Spectrum Disorder (ASD) is a complex developmental disorder which is characterized by a significant impairment in social interaction (including deficits in nonverbal communicative behaviors and in developing, maintaining, and understand relationships), speech and nonverbal communication, and restricted/repetitive behavior, interests, or activities (American Psychiatric Association, 2013).

Several studies have suggested that an overrepresentation of adolescents with co- occurring gender dysphoria (GD) and autism spectrum disorders (ASD) exists (de Vries et al., 2010; Warrier et al., 2020). The clinical assessment and treatment of youth with this co-occurrence is often challenging because of the special needs of this patient group. Diagnostic and treatment challenges may arise from deficits in social, adaptive, communication, self-awareness and self-advocacy skills, as well as from deficits in the executive functioning of adolescents with ASD. Therefore, during the assessment process the impact of the symptoms of ASD on the adolescent's ability to understand and report GD symptoms and their capability regarding engagement in therapy/treatments should be evaluated and considered subsequently in the treatment process (Strang et al., 2018).

During the COVID-19-pandemic internet-based assessments and interventions became essential in clinical work as the government measures, which were implemented in order to limit the spread of SARS-Cov-2, also limited the possibility of face-to-face contacts with patients. This limited accessibility to mental health services could be even more challenging for children and adolescents with preexisting mental health problems (Fegert et al., 2020; Golberstein et al., 2020), especially for the vulnerable group of patients with co-occurring GD and ASD.

2 Case

In this report, a case of a 17,2-year-old male to female (MtF) patient with gender dysphoria and autism spectrum disorder, who received an internet-based psychological assessment and

intervention during the COVID-19 pandemic, is described. The patient, describing herself as a transgirl (MtF) with no prior history of psychiatric treatment or diagnosis of a mental disorder initially presented to the outpatient department of a large, urban, public clinic in February 2020 asking for a psychological assessment to attest her gender dysphoria in order to get medical treatment. According to the Austrian recommendations for the treatment process for gender dysphoria in children and adolescents, patients should complete an assessment by a child and adolescent psychiatrist, clinical psychologist, psychotherapist and pediatric endocrinologist to get the diagnosis gender dysphoria confirmed. The psychological assessment should include a specific assessment of gender dysphoria, differential diagnostics of related conditions, and assessment of co-occurring disorders. During the assessment the cognitive functioning, emotional and behavioral problems, social skills, academic performance and the family functional level are evaluated (Thun-Hohenstein et al., 2017).

On the first appointment (end of February 2020) a comprehensive initial consultation including anamnesis was carried out using a semi-structured interview with the adolescent and her mother. The patient and her mother reported that the patient received psychotherapy once a week since August 2019 because of her gender dysphoria, and that the psychotherapist had suspected an autism spectrum disorder too. Although the patient had a psychological assessment at the age of five, only developmental diagnostics had been carried out at the time.

The next appointment was arranged for mid-March, but could no longer take place due to the COVID-19 pandemic government measures in Austria. As face-to-face contacts were almost exclusively allowed for acute services only, most of the appointments were canceled by the coordinating unit of the outpatient department giving the patients the information that the psychologists will be available by phone at the time of the originally agreed appointment. A few days later the patient's mother contacted the clinical psychologist by phone because the patient was concerned about the cancelled appointment. A joint conversation with the patient and her mother followed. The patient self-evaluated her level of distress as high at the beginning of the conversation, she experienced significant distress including self-harm ideations because she was afraid that she would not be able to take any further steps in the transition process. As it was unclear at that time, if and when a face-to-face appointment would be possible, a telephone call was agreed with the patient and her mother for the beginning of April 2020 to discuss the further procedure. At the end of the conversation, the adolescent was clearly relieved and could credibly assure that she won't harm herself. In case of a worsening of her condition, the patient and her mother were advised to contact the outpatient department immediately.

As previously agreed, a joint telephone conversation with the patient and her mother took place at the beginning of April. In the meantime, the patient had developed a better understanding of the current situation. Knowing that the assessment would continue without face-to-face appointments too, she was experiencing already less distress at that time. She gave consent to proceed with an internet-based psychological assessment and intervention delivered via Instahelp (a brand of Insta Communications GmbH), which is a platform founded with the aim of enabling a low-threshold access to psychological counseling.

Instahelp's official platform (https://instahelp.me/uk/), which is accessible to everyone, provides psychological online support with the focus on preventive counseling in real-time.

After choosing a professionally trained psychologist with the help of the Welcome Assistant (a chatbot), counseling via Instahelp can be carried out via computer, smartphone or tablet, in form of a chat-based counseling or audio/video calls in compliance with the General Data Protection Regulation of the EU. At our clinic an own version of Instahelp was set up on a separate platform, to which patients could only gain access by invitation from their treating clinical psychologist or psychiatrist.

The patient was informed of the online appointment both by telephone and by a message from the clinical psychologist via Instahelp, including all necessary information regarding the registration. The first online appointment took place in mid-April in form of a video call of about 90-minutes discussing the current situation, coping strategies as well as the experienced distress by the patient. Furthermore, a part of the regular psychological assessment was conducted. The latter included a semi-structured interview about the reasons for seeking treatment, the development and course of the patient's gender dysphoria, the development of identity and the coming out experiences in the various areas of life. It was decided to conduct the semi-structured interview online, because it was the most suitable part of the diagnostic process to adapt for audio/video calls as it does not contain any topics (e.g. traumatic experiences, suicidality) that would be contraindicated to evaluate in this setting knowing the patient only for a short time. Other parts of the regular psychological assessment, such as questionnaires, intelligence test, or diagnostic instruments for autism spectrum disorders would have been much more difficult to adapt to the online setting, as the procedures would either have taken significantly longer, the necessary materials would not have been available to the patient and would have resulted in a significant loss of information due to the online setting.

In an unstructured interview at the end of the appointment, the patient reported a high level of acceptance for the new approach and a reduction in anxiety regarding the expected progress in the transition process.

At the second online appointment in the beginning of May the semi-structured interview was continued in form of an audio call instead of a video call due to technical problems on the part of the patient. This time questions about the steps the patient already undertook towards a feminine appearance and about friendships and hobbies were discussed. Since the government measures in Austria and thus also at the clinic were relaxed in May, face-to-face appointments could take place again from the end of the month. Four further face-to-face appointments

took place with the patient, as well as one consultation with the patient's mother between the end of May and the beginning of July 2020. At these appointments symptoms of depression and anxiety were evaluated, a broad screening for mental disorders and a specific assessment for autism spectrum disorders including the German version of the Autism Diagnostic Interview-Revised (ADI-R; Bölte et al., 2006) and the Autism Diagnostic Observation Schedule-2 (ADOS-2; Poustka et al., 2015) were carried out. From the ADOS-2, Module 4 was administered, based on the age and language level of the patient, which consists of complex sentences. The ADOS scores were 3 in communication (threshold of 2) and 4 in social interaction (threshold of 4), with a total score of 7 (threshold of 7). Additionally, for the measurement of cognitive functions the German version of the Wechsler Adult Intelligence Scale was used (Petermann, 2012). The patient's cognitive performance was above average in comparison with her age group (Full Scale IQ of 120) with strengths in verbal comprehension as well as in working memory. The perceptual reasoning skills and the processing speed were in the average range. The patient's gender dysphoria was assessed with the semi-structured interview as well as questionnaires, in sum, the patient met all six DSM-5 criteria for gender dysphoria in adolescents. At the end of the assessment, the patient was diagnosed with autism spectrum disorder and gender dysphoria.

3 Discussion

In this case a 17,2-year-old male to female patient with gender dysphoria and autism spectrum disorder received an internet-based psychological assessment and intervention during the COVID-19-pandemic. The patient started the assessment process in order to get medical treatment for her gender dysphoria prior to the outbreak of the pandemic in Austria. As the fixed face-to-face appointments could no longer take place due to the measures of the Austrian government, she experienced significant distress, fearing that she could not make any progress in the transition process. Delays in the assessment and treatment process are generally experienced as stressful by patients, this is even more pronounced in patients with autism spectrum disorders, as they often have rigid thinking in this regard (de Vries et al., 2010; Strang et al., 2018). To reduce burden of the patient an internet-based psychological assessment and intervention through an online platform named Instahelp was provided.

Strengths and Challenges

Both the patient and her mother found the intervention helpful, the patient emphasized that it helped her a lot to get through this difficult time with many uncertainties. The patient was also relieved that she could move on with the assessment process, although she felt impatient because of the delay in general. The patient's mother was thankful for the online appointments too, as the patient was very preoccupied with the topics related to her transition. It was also a valuable experience as a clinical psychologist, testing a new treatment approach that had not been used at the clinic before. Although the new approach was well received, it was also challenging in some ways. It required many telephone calls to coordinate the appointments and to ensure the patient is adequately informed. Technical problems also made the process more difficult. The whole assessment process was generally slower, as it was necessary to ask again more often during the phone calls compared to face-to-face contact. It was also more difficult to interrupt the patient or ask short interposed questions as some subtle verbal and nonverbal clues were not noticeable through audio/video calls. It was also not possible to see the patient's facial expressions and gesturing entirely throughout the calls, which meant that valuable diagnostic information regarding ASD was lost. As face-to-face appointments could then take place later, it did not ultimately pose any major problems, but it would have been an obstacle to the assessment process if that had not been the case. In the end, the semi-structured interview took twice as much time as it usually does. Although the slowness was a disadvantage, the longer procedure made it possible to get to know the patient better, which was a clear benefit for the assessment process. Another positive aspect was being able to get to know the patient in a different setting at home and observing how she adapted to this new situation. But because the procedure was not time efficient, it will not be implemented as part of the assessment process under regular circumstances.

Limitations and Summary

Despite mostly positive experiences with the internet-based assessment and intervention, there are some limitations that need to be considered. In this case only a few online appointments took place and due to the rapid changes in the process of the pandemic neither was the psychologist trained prior to the online meetings, nor could be the process be accurately evaluated. In summary, the process described provides a good example of a possible transition of at least some parts of the face-to-face psychological assessment to internet-based assessment for similar situations in the future.

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Expositionstherapie mit Virtual Reality bei Blut-, Verletzungs- und Spritzenphobie. Eine Fallstudie

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Abstract
This case study examines the efficacy and practicability of the treatment of a patient with a blood-injection-injury type phobia including fainting and severe avoidance behavior, with the use of Virtual Reality Exposure Therapy (VRET) in an ambulant, natural setting. The patient has been treated over the course of 10 sessions. Additional to VRET, a variety of techniques from Cognitive Behavioral Therapy such as psychoeducation, cognitive restructuring, relaxation exercises and exposure therapy with pictures and videos have been used.
VRET could be integrated seamlessly in the treatment and the software used was able to trigger a strong fear response in the patient. Over the course of the treatment, the fear was significantly reduced, leading to a successful blood draw two days after the last session. In the year following the treatment the patient did several successful blood draws, all without fainting and without a significant fear response. VRET can add an important component to the existing tools in ambulant exposure therapy.

Keywords: VRET, Exposure therapy, specific phobia, blood-injection-injury type phobia, Virtual Reality, Case Report

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1 Einleitung

Die Blut-, Verletzungs- und Spritzenphobie (BVS) gehört zu den spezifischen Phobien und zeichnet sich durch eine starke Angstreaktion bei Konfrontation mit Blut, Injektionen, Verletzungen oder medizinischen Eingriffen aus. Im Unterschied zu anderen spezifischen Phobien ist die Wahrscheinlichkeit einer Ohnmacht erhöht (Bienvenu & Eaton, 1998). Die BVS gehört zu den häufigsten spezifischen Phobien (Wardenaar et al., 2017) mit einer Lebenszeitprävalenz von über 3.2–4.5% (LeBeau et al., 2010).

Seit geraumer Zeit gilt die Expositionstherapie als eines der wirksamsten Verfahren für die Behandlung von Angststörungen und spezifischen Phobien (Hoffman & Smits, 2008; Marks, 1979; Wolitzky-Taylor et al., 2008). Bei der BVS hat sich auch, vor allem bei Ohnmacht, die Technik der angewandten Anspannung (TAA) als wirksam erwiesen. Dabei werden Arme, Brust und Beine angespannt um einen Abfall des Blutdrucks zu verhindern (Öst & Fellenius, 1989).

Als Wirkmechanismus der Exposition wurde lange vor allem die Habituation an den angstauslösenden Reiz diskutiert. Neuere Theorien legen den Fokus mehr auf inhibitorische Lernprozesse, bei denen es nicht wie bei der Habituation vermutet, zu einer Schwächung bestehender angstrelevanter Erinnerungen, sondern zur Formierung neuer Gedächtnisinhalte kommt, welche mit den alten Angsterinnerungen in Konkurrenz treten (M. G. Craske et al., 2012). Trotz der guten Wirksamkeit wird die Expositionstherapie in der Praxis eher selten angewandt (Pittig & Hoyer, 2017). Gründe dafür sind mangelnde Erfahrung und Vorbehalte auf Seiten der Therapeuten (Meyer et al., 2014), systemische Barrieren wie finanzielle Aspekte und das Aufwand-Vergütungsverhältnis (Pittig & Hoyer, 2017) und der Mangel an sicheren und professionellen Expositionsmöglichkeiten (Olatunji et al., 2009). Entsprechend vielversprechend ist das Konzept der Virtual Reality Exposure Therapy (VRET), welches die Exposition des angstauslösenden Reizes über eine virtuelle Brille ermöglicht und somit viele der Schwierigkeiten eliminiert (Boeldt et al., 2019). Gerade bei der in Vivo Exposition der BVS, die die Anwesenheit medizinischen Personals voraussetzt bietet VRET einen erheblichen Vorteil. Dass die Wirksamkeit von VRET bei spezifischen Phobien der einer Konfrontation In Vivo kaum unterlegen ist, wurde in mehreren Metaanalysen gezeigt (Carl et al., 2019; Morina et al., 2015; Powers & Emmelkamp, 2008). Zur Behandlung der BVS mit VRET ist den Autoren momentan nur eine Studie von Jiang et al. (2020) bekannt, welche die tendenzielle Überlegenheit einer 90 minütigen Sitzung VRET zur Behandlung von BVS im Vergleich zu einer Wartegruppe zeigen konnte. Naturalistische Studien zu VRET und BVS gibt es bisher

noch keine. In vorliegender Fallstudie soll deswegen zum ersten Mal untersucht werden wie praktikabel und effektiv VRET bei einer BVS in einem naturalistischen, ambulanten Setting ist.

2 Methoden

Die psychologische Behandlung fand im Zeitraum von zwei Monaten statt. Es wurde ambulant im Einzelsetting in Form von zwei aufeinanderfolgenden Einheiten zu je 50 Minuten mit einer wöchentlichen Frequenz gearbeitet. Es wurde nicht ausschließlich mit VRET konfrontiert, sondern im Sinne eines hierarchischen Vorgehens auch mit Bildern, Spritzen und Videos. Die hierarchische Herangehensweise wurde trotzt neuerer Hinweise auf die höhere Effektivität variabler Stimuli (Craske, 2015) gewählt, um die Therapiemotivation nicht zu gefährden.

Die schriftliche Einverständniserklärung für die Veröffentlichung wurde von der Patientin eingeholt. Alle Daten, die zu Rückschlüssen führen konnten wurden anonymisiert. Das angegebene Geschlecht der Patientin und der Psychologin wurde randomisiert. Die Fallstudie wurde unter Berücksichtigung der CARE Guidelines (Gagnier et al., 2013) erstellt.

3 Lebensgeschichtliche Entwicklung und Krankheitsanamnese

Frau X, im jüngeren Erwachsenenalter befindlich, wurde wegen ihrer Blut- und Spritzenphobie vorstellig, welche erstmals im Alter von 6 oder 7 Jahren aufgetreten sei. Seither habe sie sich vehement geweigert, Blutuntersuchungen durchführen zu lassen. Als ebenso angstbesetzt schilderte sie das Betrachten von Verletzungen und Wunden anderer Menschen. Die Patientin berichtete, ihre Angst äußere sich auf körperlicher Ebene in Form von Herzrasen, Schweißausbrüchen, dem Gefühl einer zugeschnürten Kehle, Brechreiz und Taubheitsgefühlen in den Gliedmaßen. Außerdem leide sie unter Schwindelgefühlen, allgemeiner Schwäche und sei bereits mehrere Male in Ohnmacht gefallen.

Eine subjektive Theorie der Krankheitsentstehung konnte nicht exploriert werden. Frau X gab an, sie sehe keine Zusammenhänge zu ihren lebensgeschichtlichen Erfahrungen.

Frau X berichtete, zur Behandlung ihrer Phobie bereits ohne Erfolg Hypnose, Mentalcoaching und eine Klopftherapie versucht zu haben. Vor einigen Jahren sei sie für ein paar Monate in psychologischer Behandlung gewesen, um ihre Angst und Ekelgefühle beim Anblick von sichtbaren Verletzungen zu bearbeiten. Seither habe sie mit diesen keine Probleme mehr. Sie habe die Behandlung jedoch abgebrochen, da ihre familiäre Situation zu sehr im Fokus gestanden habe.

Kurz vor Beginn der Behandlung habe sie bei ihrer Ärztin eine Blutabnahme vornehmen lassen wollen. Dies habe nicht funktioniert, da sie ohnmächtig geworden sei.

4 Diagnose und Differentialdiagnose

Zur genauen diagnostischen Abklärung der Angstsymptomatik wurden die Interviewfragen zu Spezifischen Phobien aus dem Strukturierten Klinischen Interview für DSM IV Achse I (SKID I) (Wittchen et al., 1997) herangezogen. Alle Kriterien für eine spezifische Phobie waren gegeben. Es ergaben sich keine Hinweise auf Komorbiditäten. Zur genauen Evaluation des Behandlungserfolgs schätzte sich die Patientin vor und nach der Behandlung auf einer Angst-Intensitätsskala von 1–100 ein (Tab. 1). Auf allen drei Skalen erreichte Frau X die maximale Intensität von 100.

5 Behandlungsplan

Das Behandlungskonzept sieht 10 Behandlungseinheiten vor und beinhaltet folgende Elemente: Anamnese- und Explorationsgespräch, Psychoedukation, Vermittlung des Kognitiven Verhaltenstherapie- Modells (KVT-Modell), Biofeedback, Bauchatmung, Progressive Muskelentspannung, TAA, Konfrontation, Nachbesprechung und Erfolgsplanung. Begleitend zur Behandlung erhielt die Patientin ein Behandlungsmanual. Dieses enthält die wesentlichen Inhalte der Psychoedukation. Außerdem sind Anleitungen zur Durchführung von Bauchatmung und PMR, welche beide Angstsymptome reduzieren können (Chen et al., 2017; Lange, 2019) angehängt.

6 Behandlungsverlauf

Einheit 1–2

In der ersten Behandlungseinheit wurde ein ausführliches Anamnese- und Explorationsgespräch geführt. Der Aufbau einer vertrauensvollen Arbeitsbeziehung gestaltete sich unkompliziert. Als gemeinsames Ziel wurde definiert, eine Blutabnahme mit weitgehend gutem Gefühl zu meistern.

Die zweite Behandlungseinheit umfasste die ausführliche Psychoedukation zur Entstehung, Aufrechterhaltung und Behandlung von Angsterkrankungen.

Einheit 3–4

In der zweiten Doppeleinheit wurde zunächst der Zusammenhang zwischen Angst und Atmung erklärt und dann, unter Zuhilfenahme eines HRV Sensors (Herzratenvariabilität), die Bauchatmung erlernt. Die Patientin sollte dabei möglichst gleichmäßig über mehrere Minuten in den Bauch atmen. Im Anschluss wurde gemeinsam mit der Patientin ein individuelles KVT-Modell erstellt. In diesem wurden die angstauslösenden Situationen, die körperlichen Reaktionen sowie Vermeidungs- und Sicherheitsverhalten festgehalten und deren Funktion für die Aufrechterhaltung der Angsterkrankung besprochen. Anschließend wurden mithilfe kognitiver Umstrukturierung die Angstgedanken hinterfragt und auf ihren Wahrheitsgehalt hin überprüft und

im Anschluss eine Angsthierarchie erstellt. Im weiteren Verlauf wurde der Patientin die PMR und die TAA beigebracht.

Nach Absprache mit der Patientin erfolgte eine Konfrontation mit Bildern, die Blut, Spritzen, Infusionen und Blutabnahmen zeigen. Frau X zeigte Angstreaktionen und wurde von der Psychologin motiviert die Bilder so lange anzusehen, bis die Angst merkbar nachlasse. Sie wurde instruiert, auf Anzeichen einer nahenden Ohnmacht zu achten und falls nötig die TAA anzuwenden. Ansonsten solle sie auf eine ruhige Bauchatmung achten. Dabei sollte sie ihr Angstniveau auf einer Skala von 1 bis 10 einzuschätzen.

Es wurde vereinbart, täglich die Bauchatmung und mehrmals wöchentlich die TAA und die PMR einzuüben. Wenn sie sich dazu bereit fühle, könne die Patientin auch Videos von Blutabnahmen ansehen und dabei die in der Behandlung erlernten Techniken einsetzen.

Einheit 5–6

Frau X berichtete, dass sie nach der letzten Doppeleinheit voller Motivation gewesen sei und zuhause Videos von Blutabnahmen angesehen habe, wobei sie ihre Angst mithilfe von Bauchatmung und PMR gut bewältigen konnte. Die TAA habe sie nicht angewendet, da sie keine Anzeichen einer nahenden Ohnmacht verspürt habe. Die Patientin äußerte die Befürchtung, ihre Angst nicht besiegen zu können. Diese legte sich, da die Konfrontation mit den Bildern aus der vorangegangenen Behandlungseinheit deutlich besser ging. Danach wurden der Patientin Utensilien für Blutabnahme und Infusion (Spritzen, Nadeln, Venen-Butterfly, Armmanschette) in die Hand gegeben. Das Berühren der meisten Utensilien löste wenig Angst aus, die Armmanschette provozierte jedoch eine starke Reaktion. Die nächste Konfrontation erfolgte mithilfe der stark sichtbaren Armvenen der Psychologin. Die Patientin zeigte starke Reaktionen, wobei Ekel im Vordergrund stand. Frau X wurde motiviert, durchzuhalten und nach Möglichkeit ihren Arm durchzustrecken, was ihr zu Beginn schwerfiel, dann jedoch gut gelang. Im nächsten Schritt bekam die Patientin mit Hilfe einer VR Brille ein 360° Video zu sehen, indem einer Frau in einem Rettungswagen ein venöser Zugang für eine Infusion gelegt wird. Dabei zeigte Frau X eine vergleichsweise geringe Angstreaktion.

Einheit 7–8

Wieder äußerte die Patientin die Befürchtung, die Blutabnahme nicht zu schaffen. Die Patientin wurde beruhigt, indem die bisherigen Erfolge in Erinnerung gerufen wurden und dann erneut mit dem 360° Video der vergangenen Doppeleinheit konfrontiert. Frau X stellte fest, dass dabei kaum noch Angst empfand.

Es folgte eine Konfrontation in VR, in der eine Blutabnahme simuliert wird. Dabei handelt es sich um animierte, realitätsnahe Szenen einer Blutabnahme beim Arzt. Bei der ersten Szene saß die Patientin in einem virtuellen Warteraum und wurde zur Blutabnahme aufgerufen. In der zweiten Szene war sie als Begleitperson Zuseherin bei einer Blutabnahme. Schließlich wurde eine Blutabnahme bei der Patientin selbst durchgeführt. Um diese möglichst immersiv zu gestalten, wurde die Konfrontation mithilfe eines Desinfektionstuchs und einer Gabel von der Psychologin haptisch unterstützt. Die VR wurde von der Patientin als sehr realitätsnah wahrgenommen, sie zeigte ausgeprägte Angstreaktionen, war spürbar nervös und versuchte, bei der Blutabnahme wegzusehen. Außerdem konnte sie ihren rechten Arm nicht ganz durchstrecken. Die Patientin wurde ermutigt, die Angstgefühle auszuhalten. Dabei wurde sie in regelmäßigen Abständen gebeten, ihr Angstniveau zu skalieren. Nach mehreren Durchgängen nahm ihre Anspannung merkbar ab und es gelang ihr, den Arm durchzustrecken.

Einheit 9–10

Frau X erschien hoffnungsvoll und motiviert zur letzten Doppeleinheit. Seit der letzten Einheit habe sie regelmäßig PMR und Bauchatmung geübt, außerdem habe sie mit ihrem Freund das Abbinden des Armes probiert, was sehr gut funktioniert habe.

Dann wurde die Konfrontation in VR aus der vergangenen Stunde noch einige Male wiederholt, bis die Patientin kaum noch Angst verspürte. Das Abbinden des Armes wurde separat konfrontiert und schließlich in die VR Konfrontation miteingebaut. Nachdem das gut funktionierte, wurde in Absprache mit der Patientin die begleitete Konfrontation beendet und. In der letzten Einheit wurde die bevorstehende Blutabnahme besprochen und war der der Zukunftsplanung im Sinne einer Stabilisierung des Behandlungserfolgs gewidmet.

7 Ergebnisse

Das gemeinsam formulierte Ziel, mit einem weitgehend guten Gefühl zur Blutabnahme zu gehen, wurde nach zehn Behandlungseinheiten erreicht. Frau X konnte die im Rahmen der Konfrontation in VR simulierte Blutabnahme ruhig über sich ergehen lassen. Die anfangs geschilderten Angstsymptome traten nicht mehr auf. Entsprechend ging auch die Selbsteinschätzung auf den drei Intensitätsskalen von jeweils 100 auf 12, 11 und 10 zurück (Tab. 1).

Tabelle 1: Selbsteinschätzung der Angstintesnität Prä/Post/Follow Up

Selbsteinschätzung der Angstintensität	Prä	Post	13 Monats Follow Up
Wie stark schätzen Sie die Angst, wegen der Sie die Einrichtung aufgesucht haben, ganz allgemein ein?	100	12	10
Wie stark fühlen Sie sich durch die Angst in Ihrem Alltag beeinträchtigt?	100	11	10
Sie müssten sich Ihrer Angst jetzt sofort stellen. Wie unangenehm stellen Sie sich die Konfrontation vor?	100	10	10

Zwei Tage nach der letzten Sitzung schaffte die Patienten ihre erste erfolgreiche Blutabnahme. Im weiteren Verlauf gelang es der Patientin mehrere Blutuntersuchungen zu meistern. Eine Ohnmacht ist seit der Behandlung nicht mehr aufgetreten. Die Erfolge bestanden auf Nachfrage auch 13 Monate nach Behandlungsende und Frau X schätze sich in allen drei Fragen auf 10 ein.

8 Diskussion

Die verwendeten animierten VR Umgebungen konnten eine ausgeprägte Angstreaktion erzeugen. Wie auch Jiang et al. (2020) beschreiben, erzeugt die Kombination von VR und haptischen Reizen die besten Resultate. Entsprechend kann erwartet werden, dass die deutliche Besserung der Symptomatik unter anderem auf die erfolgreiche Konfrontation in Virtuo zurückzuführen ist. Die 360° Videos hingegen lösten vergleichsweise weniger Angst aus. Wie auch in den Leitlinen von McMurtry et al. (2016) beschrieben, scheint VRET eine gute Ergänzung in der ambulanten Therapie von BVS zu sein. Das stimmt vor allem dann, wenn keine In Vivo Konfrontation möglich ist, weil diese nicht verfügbar oder vom Patienten aufgrund zu großer Angst nicht erwünscht ist. Wenn vorhanden, sind animierte 3D Umgebungen vorzuziehen.

9 Limitation

Es wurde nicht ausschließlich VRET durchgeführt, sondern auch mit anderen Stimuli konfrontiert und zusätzliche KVT Techniken angewandt. Ebenso gab es keine Kontrollgruppe, Randomisierung und Verblindung. Die vorliegende Fallstudie gewährt einen Einblick in die Möglichkeiten von VRET in einem naturalistischen Setting, es lässt sich aber nicht abschließend sagen welche Interventionen für die Symptomverbesserung (mit)verantwortlich waren.

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