

INVESTIGATING THE USABILITY OF A DIGITAL MINDFULNESS INTERVENTION FOR INDIVIDUALS WITH PROBLEMATIC INTERNET GAMING BEHAVIOR

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Abstract: The development and adaptation of a group-therapy intervention for individuals with internet gaming disorder into a digital format are explored in this study. Leveraging content from a former group therapy program, the intervention was tailored for online delivery, with a focus on enhancing usability and treatment adherence. Usability assessments of the newly developed mindfulness-based online intervention are conducted to evaluate its effectiveness in addressing internet gaming disorder. Additionally, gamification principles are implemented to increase motivation and treatment adherence among participants. The study scrutinizes the usability and effectiveness of the digital intervention in supporting individuals suffering from internet gaming disorder.

Keywords: internet gaming disorder, digital intervention, mindfulness-based therapy, usability, gamification.

INTRODUCTION

Keys learning aims 2. Content from a former group-therapy intervention was adopted and adjusted for digital use.

1. The usability of a newly developed mindfulness based 3. Gamification principles are used and described which online-intervention for people suffering from internet were installed to increase motivation and treatment gaming disorder is under Scrutiny. adherence.

Usability of a mindfulness based online intervention developed for people with problematic internet gaming behavior

Most internet gamers are casual players; however, some develop an attachment to internet games that can be considered pathological. The *Internet Gaming Disorder* (IGD) was included in the latest version of the Diagnostic Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) as research diagnosis. The reported prevalence rates for IGD vary from less than 1 to 10% (Lemmens et al., 2015; Petry et al., 2014; Wartberg et al., 2017) and comorbid disorders such as social phobia, attention deficit disorder, depression and obsessive-compulsive disorder appear commonly (Carli et al., 2013; Mallorquí-Bagué et al., 2017). The internet gaming population still suffers stigmatization and since prevalence rates IGD are relatively low, the risk of pathologizing normal behavior is comparably high (Kardefelt-Winther et al., 2017). Assessment methods and construct conceptualizations for IGD are quite diverse (King et al., 2013). Literature focusing on the treatment of IGD however, is relatively sparse in comparison to other potential behavioral addictions and more readily available treatment options (advisory interventions and psychopharmacotherapy) are often associated with high costs and/or side effects. However, focusing on treatment effectiveness the research on psychotherapeutic interventions in the form of cognitive behavioral therapy seems promising, especially when combined with psychopharmaceutic interventions (Han et al., 2010; King and Delfabbro, 2014). Overall, the IGD population is heterogeneous, with a lack of recommended treatment strategies, large numbers of relapses and treatment often

involves the necessity of high-cost interventions (for an overview of reviews and studies, see King et al., 2017; King et al., 2017; Torres-Rodríguez et al., 2018). These high costs often lead for people that suffer from symptoms of IGD to refuse treatment or become noncompliant during the process of abstinence due to a lack of alternative coping strategies. The research on interventions with better accessibility, such as online interventions, for IGD is especially sparse. Due to the associated proximity of the dysfunctional behavioral patterns in IGD (i.e. online-gaming) and the computerized intervention it is assumed that this might lead to an increase in severity of IGD related symptoms. Yet, other than arguments drawing from the theory of stimulus control (i.e. increasing distance between the problematic stimuli) including an abstinence focus, to the knowledge of the authors, regarding their validity these assumptions have not been further scrutinized. Also, in our increasingly digitized world an avoidance focus regarding computers and smartphones leads to a cascade of resulting issues, such as feelings of exclusion, not being able to participate in social interactions and so on. Thus, a restricted use of computers and smartphones cannot be regarded as a sustainable intervention approach. This study introduces an intervention with a low entry threshold and short-term focus which encompasses resulting trans-diagnostic psychological deficiencies of people suffering from IGD such as emotion regulation problems, attentional disturbances, automatic dysfunctional behavioral patterns and diminished awareness towards deprived needs. It was decided to transfer and expand an already established alternative method for people suffering from addictions which is *Mindfulness-Oriented Recovery Enhancement* (MORE; Garland, 2013). Originally, MORE is applied in a group-setting over eight or more consecutive weeks. Evidence for the effectiveness in treating IGD could already be provided (Li et al., 2017). MORE combines mindfulness meditation, elements of reappraisal of negative events and positive psychology into an integrative treatment to disrupt dysfunctional behavioral and cognitive patterns and to reestablish awareness for deprived needs. The benefits of mindfulness interventions for treatment and motivation for people suffering from (substance) addiction (Li et al., 2017b) and gambling addiction (Toneatto et al., 2014) is plentiful. To circumvent the treatment gap (Kohn et al., 2004) and add flexibility to the application of the intervention, a transfer of the adopted content to an online setting seems promising. The effectiveness of online based interventions to bridge waiting period was already shown (Fuhr et al., 2018). Furthermore, an online application of an intervention represents a low-threshold and cost-effective possibility to reach people who otherwise would not have been able to find help. In the best-case scenario an intervention should be as motivating as internet gamer are captivated by internet games. Regarding underlying motivational mechanisms, Yee (2006) offered a conceptualization of player types via the distinction into three categories (Achievement, Social, Immersion). The components of “Achievement” entail advancement, mechanics and competition. “Social” comprises socializing, relationship and teamwork whereas “Immersion” contains discovery, role-playing, customization and escapism. Yet, these motivational concepts described above are not only present in games but have also been adopted via the use of operationalized gamification principles in a variety of other domains. Implementing gamification principles can enhance work or learning processes, increase motivation and subsequently performance (Sailer, 2016). The stigma around gamification principles arises due to the underlying framework for which they are used in onlinegames (such as increasing the volume in microtransactions and furthering gambling experiences [i.e. loot-boxes] to increase commitment). It can be argued that using the familiarity with gamification principles by applying these principles to an intervention for people suffering from pathological internet gaming offers a nonintrusive way to help shift dysfunctional behaviors to a functional need fulfilling behavior, giving a functional framework. For instance, in a study by Miloff et al. (2015), a gamified intervention for people suffering from social anxiety was introduced which incorporated a high degree of

personalization, anonymous social interactions and further gamification techniques. Instead of condemning addiction maintaining learning mechanisms, an implementation of those same mechanisms for a functional transfer to alternative coping behaviors seems helpful and resource oriented. The developed intervention *Room2Respawn* uses gamification principles in its design by focusing on the following dimensions: points as a reward system, see also (Sailer et al., 2017; Werbach and Hunter, 2012), levels to structure tasks and increase salience of goals (Stinson et al., 2013), badges as collectibles to promote motivation (Eickhoff et al., 2012), personalized contact to increase identification (Reeves and Read, 2009) and leaderboards for social comparison and competition (Burguillo, 2010; Crumlish and Malone, 2009). This study aims at exploring the applicability and usability of an online administered treatment with mindfulness elements for people suffering from symptoms of IGD. This problematic IGD related behavior is defined as people showing symptoms, such as withdrawal, preoccupation, tolerance and further, being measured in the IGDT-10 (Király et al., 2017). However, surpassing a certain threshold of problematic IGD related behavior was no necessity for participation. Instead the population of interest were people with experience in online-gaming related behaviors to firstly test the applicability and usability of the newly developed intervention and circumvent possible adverse effects for severely IGD disordered people arising due to an unclear non-applicability of the proposed intervention. To the authors, it is of utmost necessity for any intervention with no in-person contact (in which a direct clinical control is not possible) to take precautions and first explore the interventions validity with a more functional population, such as with people having experience with online-games and only show some signs of IGD. Gamification principles were incorporated to deliver the intervention content in a known framework for an internet gaming population. Since the usability of a gamified intervention for people suffering from IGD has to the author's knowledge never been tested, a framework with a gamified experimental condition and a balanced, neutral condition was chosen as control. Of primary interest for this investigation is an adequate usability over the duration of the intervention (four weeks). It is hypothesized that participants will rate the usability of the intervention elements across all measures as above average. On a secondary level it is hypothesized that the reported (intrinsic) motivation for people to reduce internet gaming behavior will increase after the intervention. Overall, it is expected that usability and motivation will be rated higher for people in the gamification condition than for people in the control condition. On an exploratory level the comments made by participants regarding the intervention will be qualitatively investigated. Lastly, participation and dropout-rates between groups are explored. A subclinical sample with gaming experience was chosen as a first step for further optimization of the intervention.

METHODS

Participants

Inclusion criteria were age between 18 and 40 years, German mother tongue and gaming experience. Exclusion criteria were the use of illegal substances, mental illness and pathological signs of internet gaming disorder. To take precautions, prospective participants that were showing strong signs of IGD were forwarded to specialized clinics offering already established treatment options. Interested participants who reported having experiences with internet gaming were chosen and randomly allocated to the neutral control or gamified experimental condition. Participants were recruited via flyers on the university premises, in online forums and social media. The starting sample consisted of 49 participants (24 females; 25 males) between 18 and 35 years of age ($M = 24.41$, $SD = 3.72$ years). Participants missing four or more sessions were excluded (dropout: four participants experimental condition, six participants control condition) resulting in a final sample of 39 participants for analyses. The remuneration of the participants was either financial (50€) or with credit points as a trial subject.

The latter are a necessity for students to obtain their bachelor degree at the University of Düsseldorf. Informed written consent was obtained from all participants. The study was approved by a local Ethics Committee.

Instruments and Intervention

Computer system usability questionnaire (CSUQ)

The German version by Böckermann et al. (2015) of the CSUQ (Lewis, 1995) was used and for study purposes, the original 19 items were extended by 11 additional items to capture usability ratings regarding email interactions. Statements range on a Likert scale from 1 = don't agree at all to 7 = completely agree.

Control questions (CQ)

Two questions succeeding every intervention session were implemented to control whether the participants revised the exercise content for each session. The questions were designed by the authors and presented in a multiple-choice format with one correct answer possibility.

Intrinsic motivation inventory (IMI)

The IMI (first used in Ryan, 1982) is rooted in Self Determination theory and consists of 45 items on six subscales. These were reduced to 27 items with a changed reference from this activity to this exercise and translated into German for the purpose of this study. Answers are recorded within a 7-point Likert scale ranging from 1 to 8 with higher overall values indicating stronger approval of the respective subscale (1 interest or pleasure, 2 perceived competence, 3 perceived choice, 4 effort, 5 feeling pressure or tension, 6 usefulness); Cronbach's α ranging from .82 to .91 (Monteiro et al., 2015).

Socio-demographic questionnaire

In addition to age, gender, education and knowledge of German, the sociodemographic questionnaire also covered previous experience with meditation, diagnosed mental illnesses, illegal substance use and frequencies of digital media and video game consumption of the participants.

Ten-Item Internet Gaming Disorder Test (IGDT-10)

The IGDT-10 (Király et al., 2017) contains 10 items which measure the extent of pathological internet gaming behavior based on the DSM-5 criteria for Internet Gaming Disorder. Item nine and ten refer to the same facet of the disorder and contribute each 0.5 points towards the sum of the scale. The IGDT-10 was translated into German for the purposes of the study. A cut-off score of five out of nine points represents a strong indication of an underlying disorder. In the response format, answer possibilities are Never, Sometimes, and Often. The IGDT-10 has an internal consistency of Cronbach's $\alpha = .68$.

Usability evaluation questionnaires (UEQ)

The self-developed questionnaire for the evaluation of the intervention content is divided into four sub-scales: email (five items), psychoeducation (two items), meditation (four items) and intervention in general (two items). Dimensions are length, interestingness, favorability and comprehensibility evaluated on a 7point Likert scale with corresponding varying anchors. Furthermore, participants could also comment open-ended within a text box. In the experimental group the level of gamification of the intervention content was also evaluated using a questionnaire including 42 items with seven questions each for the implemented gamification elements (pseudonym, daily quiz, score, leaderboard, level and badge). Answers were recorded using a 7-point Likert scale ranging from 1 = not at all to 7 = agree completely and a commentary box for open-ended answers.

Design

In the quasi-experimental design of the study the experimental condition received a gamified intervention content whereas the control condition received a neutral version with the same, balanced content.

Gamification Elements

The email communication with the participants contained the gamification elements that were implemented. In the gamification condition participants were asked to create a personal username (1a Personalization), interventions were referred to as levels (2a Levels), a leaderboard (3a Leaderboard) showed the current score (correct responses in control questions and working through content awarded points) and ranking in comparison to fellow participants and lastly a badge (4a Badge) depicting a progressively more evolving meditating person after the first and with every three successfully completed session. The gamification elements were balanced as follows in the neutral condition: a standardized neutral code (1b Subject Code), interventions were referred to as sessions (2b Session), an overview (3b Overview) about the weekly content was shown and the logo for *Room2Respawn* was depicted (4b Logo).

Content for the Intervention

The main content for the intervention has been adopted largely from MORE (Garland, 2013), selected by clinicians for suitability and translated into German for the purpose of this study and adjusted for internet gaming behavior. The content of the intervention (12 sessions) was the same for experimental and control group and can be reviewed in MORE (Garland, 2013) or under <http://www3.hhu.de/room2respawn/>. All mindfulness meditations were recorded by a trained psychotherapist and adjusted in content for internet gaming behavior. The fifth session had to be completed solely in writing, all other exercises contained a meditation (7 min and 25 s on average). An overview about the sessions, topics, psychoeducational content, mindfulness-exercises and the implemented questionnaires is given in Table 1.

Procedure

Interested possible participants contacted the researchers via email and received a link for the online screening. The latter consisted of an informed consent, a declaration of data protection, sociodemographic questions and the IGDT-10. All answers were collected and carried out via the online questionnaire service SoSciSurvey (Leiner, 2018). Subsequently, all included participants received an email with general information about the course of the study and an invitation to participate in the pretesting (t00). The intervention content was published on each intervention day (three times a week; on Monday, Wednesday and Friday) at 10 a.m. on an intervention blog entitled *Room2Respawn* which was created for the purpose of this study. After each session, the content remained on the blog for the remainder of the intervention. The content could be edited until 10 p.m. on the evening of the subsequent intervention session. Since participants received an email for each individual session, this email also included a link to the post-session survey. The post-session survey included a question of conscience to check whether the content was revised, a control question in a multiple-choice format regarding the psychoeducation and mindfulness-exercise, and evaluative multiple-choice questions regarding the intervention content. In case a session was missed, participants received an email asking them to attend the next session again, stating that it was not possible to complete the intervention at a later point in time. After having missed three sessions altogether a warning was sent, describing that the next miss would lead to exclusion from participation. At the end of the last intervention session all subjects were invited via email to take part in the final post-intervention survey after which they received an email of appreciation for their participation, a debriefing and their remuneration.

Data analysis

All statistical analyses were carried out at a significance level of 0.05, using IBM SPSS Statistics (25). Independent variables are condition, operationalized as gamification (experimental) or neutral (control) group and time of measurement. Dependent variables were usability ratings (dimensions: email, psych education, meditation, length) and (intrinsic) motivation. Data was collected at 15 timepoints (screening, pre-measurement, 12 interventions, postmeasurement). Of primary interest for this study was the evaluation of overall usability measured in time point's t1, t6 and t13 with the CSUQ and overall time points with the UEQ. For the main analyses, UEQ = Content Evaluation via UEQ. CQ = Control Questions. SD = Sociodemographic Questionnaire. IGDT-10 = Ten-item Internet Gaming Disorder Test (Király et al., 2017). CSUQ = Computer System Usability Questionnaire (Böckermann et al., 2015). IMI = Intrinsic Motivation Inventory (Ryan, 1982). EQ = Evaluation of Gamification. All exercises were adopted from MORE (Garland, 2013) or from indicated sources. *(Luciano-Soriano et al., 2001), **(Wengenroth, 2016).

Table 1. Overview about intervention content and implemented questionnaires.

Session screening	Topic	Psychoeducation	Mindfulness-exercise	Questionnaires privacy policy; SD; IGDT-10
Pre-test (t00)				
1 (t01)	Introduction	What is mindfulness?	First meditation	CQ; CSUQ; IMI
2 (t02)	Automatisms dependency	on Automatisms on dependency	Breathing meditation	UEQ; CQ
3 (t03)	Automatic behavior	What are (your) triggers?	Chocolate-exercise	UEQ; CQ
4 (t04)	Mindful evaluation	Cognitive restructuring/ mindful appreciation	Mindful enjoyment	UEQ; CQ
5 (t05)	Positive experience	Acceptance through mindfulness	Hitlist of the most common negative thoughts**	UEQ; CQ
6 (t06)	Overcoming the pressure of addiction	The nature of desire	Raisin-exercise	CSUQ; CQ; UEQ; IMI
7 (t07)	Dealing with stress	Craving & stress	Imagined stress and relaxation reply	UEQ; CQ
8 (t08)	The ephemeral body	The nature of transience	Transience-exercise	UEQ; CQ
9 (t09)	The relevance of human relationships	How relationships affect dependency	Loving-kindness meditation	UEQ; CQ
10 (t10)	Internal criticism and willingness to change	Diffusion - defending yourself against the inner critic	Readiness - "the brittle dam"*	UEQ; CQ
11 (t11)	The mindful view of the future	What have we learned?	Future music	UEQ; CQ
12 (t12)	Target and value-congruent action	Target and value-congruent action	Mindful breathing	CQ CSUQ; IMI; EQ
Post-test(t13)			IGDT-10 Debriefing	

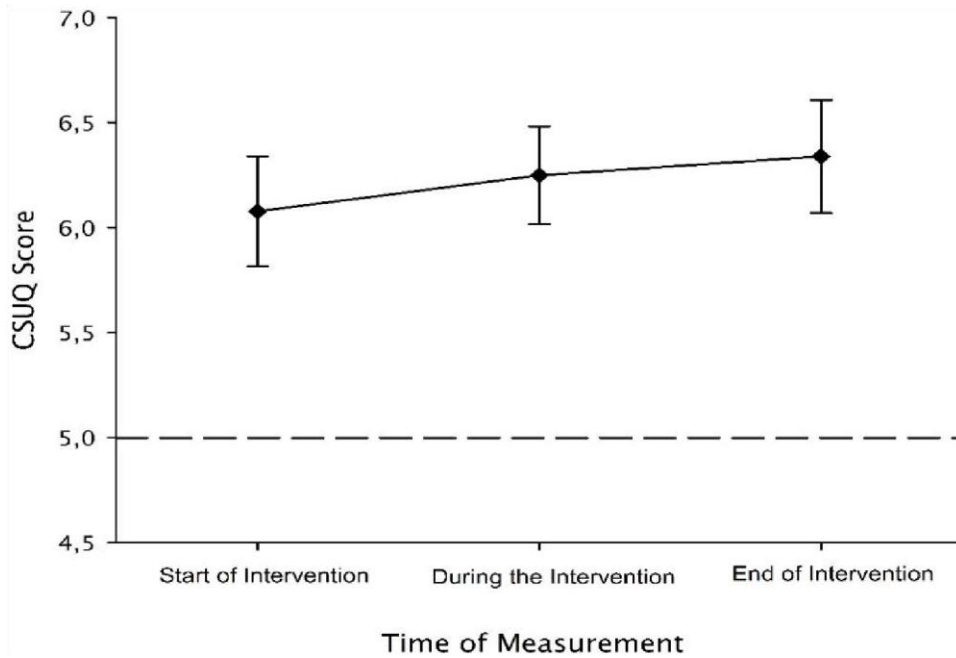


Figure 1. Ninety-five percent confidence intervals around means for usability ratings in the computer systems usability questionnaire at the start, during and at the end.

Table 2. mean differences with standard deviations in parentheses in internet gaming related behaviors between control and experimental condition.

Parameter	Experimental condition	Control condition	<i>t</i> -Test values with df in brackets	<i>p</i> Values
Age	23.44 (2.76)	25.42 (4.35)	$t(47) = -1.91$	0.063
Computer gaming behavior				
Daily hours	1.83 (1.25)	1.67 (1.24)	$t(34) = 0.40$	0.69
Game console behavior Daily hours				
	1.67 (.52)	2.00 (1.63)	$t(11) = -0.48$	0.642
Mobile gaming behavior				
Daily hours	1.17 (.75)	1.44 (1.42)	$t(13) = -0.44$	0.67
Computer gaming experience in years	10.5 (5.57)	13.5 (3.62)	$t(45) = -2.23$	0.031*

* $p < .05$.

Table 3. Means with standard deviations in parentheses of the dimensions of the usability evaluation questionnaire for conditions.

Experimental condition		Control condition	Total/overall
N	21	18	39
Email	2.57 (.78)	2.07 (.81)	2.34(.79)
Psychoeducation	2.17 (.49)	1.95 (.68)	2.07 (.59)
Meditation	2.50 (.70)	2.39 (.72)	2.45 (.71)
Length	4.31 (.34)	4.13 (.30)	4.23 (.32)

Answers for email, psychoeducation and meditation range on a Likert scale from 1 = positive evaluation to 7 = negative evaluation; length ranges from 1 = too short to 7 = too long.

Table 4. Means and standard deviations of the subscales of the intrinsic motivation inventory before and after the intervention for conditions.

Experimental condition

		Control condition		Overall
Subscale	Time of measurement			
Interest or pleasure	t1 t12	5.31 (0.99)	5.22 (1.14)	5.26 (1.06)
		5.13 (1.42)	5.59 (1.21)	5.38 (1.31)
Perceived competence	t1 t12	4.13 (0.76)	4.11 (0.90)	4.12 (0.82)
		4.37 (0.65)	4.26 (0.70)	4.31 (0.67)
Perceived choice	t1 t12	5.12 (1.01)	5.13 (1.20)	5.13 (1.09)
		5.35 (1.09)	6.01 (1.11)	5.70 (1.13)
Effort	t1 t12	4.22 (1.03)	4.05 (0.53)	4.13 (0.80)
		4.23 (1.10)	4.02 (1.03)	4.12 (1.05)
Felt pressure or tension	t1 t12	2.45 (1.18)	2.65 (1.31)	2.55 (1.23)
		2.38 (0.85)	2.19 (0.88)	2.28 (0.86)
Usefulness	t1 t12	5.67 (1.08)	5.82 (0.93)	5.75 (0.99)
		5.13 (1.45)	5.69 (1.01)	5.43 (1.25)

30) = 5.33, $p = .028$, $\eta^2 = .15$). Except for that, no statistically significant changes in respecting subscales could be observed. There were no statistically significant interaction effects for time and condition.

For exploratory reasons, participation and dropout rates between experimental and control condition were compared. Participants in the control condition missed on average 0.61 ($SD = 0.85$) interventions, whereas participants in the experimental group missed 0.71 ($SD = 0.90$) interventions. This difference was not statistically significant, $t(37) = 0.37$, $p = 0.717$. Analyses of the dropout rates between control group (25 percent) and experimental group (16 percent) did not conclude statistically significant results, $U = 273.000$, $p = 0.439$.

Qualitative evaluation of the main comments regarding improvable aspects of the intervention, revealed an improvement of email layout, rework of badges, clearer instructions, shorter sentence structure and improvement

of the text layout. For the meditations, background music, slower pace, and slightly longer durations were suggested.

DISCUSSION

The goal of the present study was to determine the usability and applicability of a newly developed online intervention (*Room2Respawn*) for people suffering from IGD. A population of people with internet-gaming experience has been chosen to indicate applicability and usability of the intervention. Overall, the usability of *Room2Respawn* was rated as good and participants evaluated all associated subscales positively. Applicability of content, email, psychoeducation and length of exercises were rated as good and satisfactorily. Usability ratings did not differ between gamified experimental or balanced control conditions. Participants in both conditions reported higher perceived choice and lower usefulness at the end of the intervention. Since these results are inconclusive, the motivation hypothesis needs to be rejected. Additionally, there was no statistically significant indication that the gamified version of the intervention was more motivating for participants. Descriptively, there were fewer dropouts present in the gamified condition. Participants rated the website as good and easy to use. However, some participants commented that the design could be improved. More experience with digital media means higher expectations regarding the interface (Crumlish and Malone, 2009). Reviewing the comments which the participants made it seems promising to further professionalize the recorded meditations by adding more structure, a slower pace and more breaks. Due to the structure of the intervention, it was not possible for participants to individualize their treatment schedule. Adding more opportunities for personalization could lower dropout-rates and encourage participation. However, finding a sensible balance regarding autonomy and freedom is a challenging task for further redesign. The effects of gamification are context-dependent and controversially discussed. Benefits on performance and (intrinsic) motivations are reported (Sailer, 2016), yet, the collected data does not provide evidence towards this. Due to continuous exposure to gamified digital content, people become increasingly familiar with its mechanics. Thus, implementing only a few basic options, such as leaderboards, badges, levels and a pseudonym, this could have an adverse effect on participation and motivation by making a lack of quality in implementation salient. The reduced perceived usefulness could be explained by an emerging redundancy in psychoeducational content. The observed increase in perceived choice hints at an increase in perceived autonomy in participants due to the intervention but needs to be scrutinized in a follow-up study. Furthermore, in a revision of *Room2Respawn*, the inclusion of a chat forum for participants could represent a further step to increase feelings of belonging (Lavigne et al., 2011) and help foster collective growth orientation. The lack of social embeddedness represents one of the most apparent differences of this intervention compared to MORE (Garland, 2013). One limitation of the present study, besides a larger sample size, is the lack of validation of the translated intervention and meditation texts taken from MORE (Garland, 2013), the translation of the IGDT-10 into German and adjusting the IMI. Also, the CSUQ was extended by adding a dimension of email usability. Additionally, sample characteristics could limit generalizability since the sample was well-educated and had some experience with internet gaming but not in clinical amounts. There were some technical issues due to which some emails were not received by the participants or human error occurred and wrong badges were sent to participants. Besides possible influences on usability that these issues might have caused, reduction of the interference of technology could be achieved by adjusting the intervention content to run on a single platform or by automatizing communication via email. To summarize, content from a mindfulness-based intervention which has already proven effective for the treatment for IGD was successfully adopted to an online platform (Garland, 2013; Li et al., 2017). *Room2Respawn* was conceptualized as a short-term intervention that

uses a gamified framework to approach people suffering from IGD to alleviate symptoms and promote a needscongruent way to learning alternative coping mechanisms. Due to the more rapidly growing digital world and the increasing demands on the individual to cope with this, it is crucial for research and treatment to keep up. After taking the results of this study into consideration and redesigning some parts of the intervention, the effectiveness of Room2Respawn should be tested on a sample with participants showing clinical symptoms of internet gaming disorder.

Key practice points

1. Moving from group-settings or face-to-face settings to a digital form of communication with clients suffering from pathological internet gaming is possible and shows promising usability and applicability.
2. Digital and internet-based interventions can be used before, during and after “traditional” face-to-face CBT.
3. For a successful blend of methods, it is crucial that practitioners are familiar with the content of the interventions and its main goals to ensure a synergistic efficacy.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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