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Efficacy of Short-term Treatment of Internet and Computer Game Addiction
A Randomized Clinical Trial

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➕ **Author Audio Interview**

➕ **Supplemental content**

IMPORTANCE Internet and computer game addiction represent a growing mental health concern, acknowledged by the World Health Organization.

OBJECTIVE To determine whether manualized cognitive behavioral therapy (CBT), using short-term treatment for internet and computer game addiction (STICA), is efficient in individuals experiencing internet and computer game addiction.

DESIGN, SETTING, AND PARTICIPANTS A multicenter randomized clinical trial was conducted in 4 outpatient clinics in Germany and Austria from January 24, 2012, to June 14, 2017, including follow-ups. Blinded measurements were conducted. A consecutive sample of 143 men was randomized to the treatment group (STICA; n = 72) or wait-list control (WLC) group (n = 71). Main inclusion criteria were male sex and internet addiction as the primary diagnosis. The STICA group had an additional 6-month follow-up (n = 36). Data were analyzed from November 2018 to March 2019.

INTERVENTIONS The manualized CBT program aimed to recover functional internet use. The program consisted of 15 weekly group and up to 8 two-week individual sessions.

MAIN OUTCOMES AND MEASURES The predefined primary outcome was the Assessment of Internet and Computer Game Addiction Self-report (AICA-S). Secondary outcomes were self-reported internet addiction symptoms, time spent online on weekdays, psychosocial functioning, and depression.

RESULTS A total of 143 men (mean [SD] age, 26.2 [7.8] years) were analyzed based on intent-to-treat analyses. Of these participants, 50 of 72 men (69.4%) in the STICA group showed remission vs 17 of 71 men (23.9%) in the WLC group. In logistic regression analysis, remission in the STICA vs WLC group was higher (odds ratio, 10.10; 95% CI, 3.69-27.65), taking into account internet addiction baseline severity, comorbidity, treatment center, and age. Compared with the WLC groups, effect sizes at treatment termination of STICA were $d = 1.19$ for AICA-S, $d = 0.88$ for time spent online on weekdays, $d = 0.64$ for psychosocial functioning, and $d = 0.67$ for depression. Fourteen adverse events and 8 serious adverse events occurred. A causal relationship with treatment was considered likely in 2 AEs, one in each group.

CONCLUSIONS AND RELEVANCE Short-term treatment for internet and computer game addiction is a promising, manualized, short-term CBT for a broad range of internet addictions in multiple treatment centers. Further trials investigating the long-term efficacy of STICA and addressing specific groups and subgroups compared with active control conditions are required.

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I n 2013, internet gaming disorder was included in the *DSM*-5 as a condition warranting further research.[1] Similar to gambling disorder,[2] criteria encompass preoccupation, withdrawal, tolerance, and continued use despite negative consequences. Based on the growing scientific evidence, gaming disorder has recently been introduced as a new diagnosis in the *International Classification of Diseases, 11th Revision*, in the section Disorders Due to Substance Use or Addictive Behaviors.[3] Other subtypes of internet addiction (IA) will be classified as "other specified disorders due to addictive behaviours."[3] A broad concept of IA was discussed contentiously.[4] Notwithstanding, there is also support for a broader concept.[5]

The broader concept of IA represents a manifestation of specific activities in the internet, which might be gaming; the use of social network services, such as chats; surfing sites providing pornographic material; participation in gambling; collecting as well as streaming videos or movies; excessive shopping; or aimless gathering or searching for information. Internet addition is therefore characterized by (1) impaired control regarding onset, duration, termination, frequency, intensity, and context; (2) an increased priority given to internet applications to the extent that these tasks take precedence over alternative life interests as well as daily activities; and (3) escalating activity, despite the occurrence of negative consequences. The indicated behavior is sufficiently severe and causes significant impairment in family, social, educational, personal, occupational, or alternative relevant areas of functioning.[3]

It is widely agreed that IA represents a broader concept.[5] Different subtypes sharing core features (eg, loss of control, craving, salience, preoccupation.) of IA have been proposed, such as gaming, social media, and online pornography.[5-7] Proponents of a unitary conception of IA have pointed toward similarities in neurobiological and phenomenological sources with other addictive behaviors.[8-11] In males, the most frequent subtype of IA is internet gaming disorder.[12] Many empirical findings on neurobiological mechanisms have supported the concept of behavioral addiction.[8,10,11]

A growing body of research has indicated high prevalence rates for IA of 3% to 6%.[13] Epidemiologic studies and data from predominantly male treatment seekers have linked IA to psychosocial problems, psychopathologic disorders, poor physical health, and decreased quality of life.[12-15]

Cognitive behavioral therapy (CBT) has been suggested for the treatment of IA, addressing dysfunctional cognitions, social and behavioral deficits, motivation to change, and re-establishment of alternative behaviors.[16] A preliminary meta-analysis[17] including 16 intervention studies found large effect sizes of CBT on IA symptoms ($g = 1.48$; 95% CI, 0.84-2.13). Individual vs group, female, older, and North American participants indicated better treatment responses. As in a more recent review on CBT,[18] the authors questioned the validity of these studies owing to methodologic shortcomings, lack of randomization and adequate controls, inconsistencies of assessment, insufficient information on recruitment and samples, and lack of manualized treatments.[18]

To overcome these shortcomings, we conducted a multicenter randomized clinical trial based on short-term treatment for internet and computer game addiction (STICA), a

Key Points

Question Is manualized cognitive behavioral short-term therapy an efficient treatment of internet and computer game addiction?

Findings In this randomized clinical trial of 143 men, a strong remission rate for internet and computer game addiction was noted with cognitive behavioral therapy in the treatment group vs a wait-list control group.

Meaning Short-term CBT treatment in outpatient settings addressing internet and computer game addiction is effective.

manualized CBT program combining group and individual interventions.[19,20] The STICA method had been successfully pretested in a pilot study with 42 patients with IA.[20] Pre-post effect sizes on our main outcome, the scale for the Assessment of Internet and Computer Game Addiction (AICA-S)[21] were strong ($d = 1.0$) when based on intent-to-treat analyses.

Methods

Study Design and Implementation

A multicenter randomized clinical trial was conducted in 4 outpatient clinics in Germany and Austria from January 24, 2012, to June 14, 2017, including follow-ups. Data were analyzed from November 2018 to March 2019. The outpatient clinic for behavioral addictions in Mainz, Germany, developed the CBT program based on a long history of treating patients with gambling disorder as well as different subtypes of IA: therapy modules that proved effective in clinical experience were first summarized in a manual, then tested in a pilot study with a small sample size and pre-post design.[22] Findings were promising and gave impetus for the design in the present STICA study.

The study protocol (available in Supplement 1) was approved by the ethics committee of the State Chamber of Medicine in Rhineland-Palatinate and the local ethics committees at each site. According to a standardized protocol, an electronic clinical report form was implemented. Data were documented, monitored, and stored in a database by the Interdisciplinary Center for Clinical Trials Mainz, which conducted data analyses. Serious adverse events were reported within 24 hours, which is independent of the participating research centers and further processed the serious adverse events reports as requested by ethics committees. An independent data monitoring and safety board was established. Written informed consent was required. Participants were offered vouchers for traveling costs but did not receive financial incentives.

To evaluate STICA's efficacy, we recruited patients from 2012 to 2016, in specialized outpatient clinics at 4 university medical centers in Mainz, Tübingen, and Mannheim, Germany, and Vienna, Austria. The population was limited to men, who represent 90% of the patients treated or diagnosed in outpatient clinics for behavioral addictions. Randomized patients fulfilled diagnostic criteria of IA and were allocated to the STICA or a wait-list control (WLC) group. Remission of IA based on predefined criteria was our main end point at termination of the intervention. Secondary end points included level

Figure 1. CONSORT Diagram
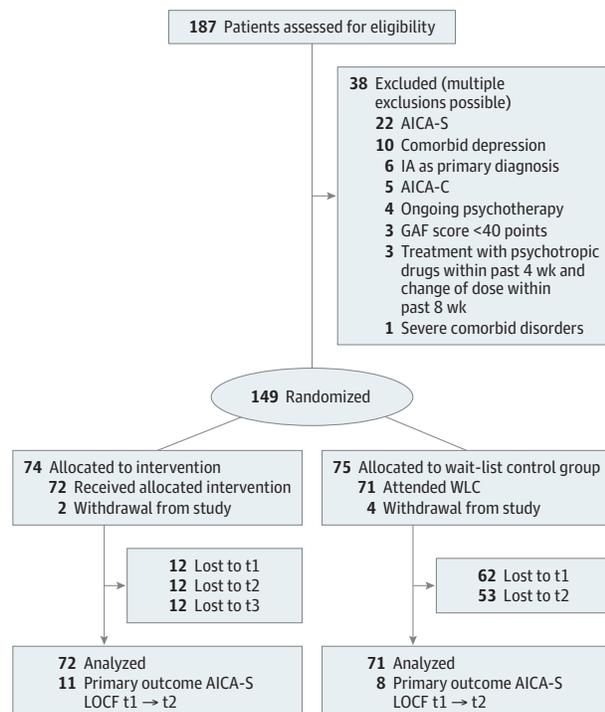
AICA-C indicates Assessment of Internet and Computer Game Addiction self-report; AICA-S, Assessment of Internet and Computer Game Addiction clinical expert rating; GAF, Global Assessment of Functioning; LOCF, last observation carried forward; t1, time factor, midtreatment; t2, time factor, termination; t3, time factor, 6-month follow-up; and WLC, wait-list control.

of psychosocial functioning, depressive symptoms, and pre-occupation with online activities.

Study Participants

Participants were mostly referred by general practitioners, psychotherapists, and psychiatrists; fewer were self-referred via the webpage or media coverage of the trial in local newspapers. Men aged 17 to 55 years meeting criteria for IA in the past 6 months according to clinical expert ratings (AICA-C) and the AICA-S self-report measure were eligible for participation (eTable 1 in Supplement 2). Additional information on inclusion can be found in the eMethods in Supplement 2.

Randomization

Randomization was carried out separately for each site according to computer-generated randomization lists by the Interdisciplinary Center for Clinical Trials Mainz, the independent randomization unit. Considering a possible group size of up to 8 patients, up to 16 patients were to be randomized (ratio 1:1) at the same time. After confirmation that a patient fulfilled all inclusion criteria, the electronic clinical report form immediately provided the investigator with the randomization results. Patients were subsequently informed about their inclusion and the intervention started shortly after. Observerrated outcome measures were assessed by clinicians who were blinded to the study condition.

Treatment

Short-term treatment for internet and computer game addiction is a 15-week, CBT-based, manualized treatment for IA[19,20] The method is based on the integrated process model of internet addiction (InPRIA-model[23]), which conceptualizes IA as resulting from a dynamic interaction of individual factors, features of the online activity, dysfunctional coping strategies, and disorder-specific cognitive biases. eTable 2 in Supplement 2 gives an overview of the treatment phases with 15 group sessions (100 minutes). Eight individual sessions (60 minutes) are interspersed in the program to promote treatment motivation and provide crisis intervention.

Therapists

Seven (4 women) cognitive-behavioral therapists conducted CBT. All therapists held degrees as clinical psychologists or physicians and had completed their psychotherapeutic training or were undergoing advanced CBT training. Therapists were specifically trained in the treatment manual by the authors (K.W., K.W.M., M.D., M.E.B.). To maintain treatment fidelity during the trial, therapists videotaped sessions and received regular supervision. These supervisory interactions were conducted in a ratio of 1 in 4 group sessions.

Assessment and Blinding

As depicted in **Figure 1** (CONSORT diagram), the 4 measurement points included baseline (pretreatment; t0), midtreatment (2 months after treatment start; t1), posttreatment after approximately 4 months (t2), and 6-month follow-up (t3, STICA group only).[24] Midterm assessment was carried out to compensate for missing data.

The tool used in assessment of the primary outcome was the AICA-S. This self-report measure assesses the main *DSM-5* criteria for internet gaming disorder by 14 items, including the frequency of 8 internet activities (eg, gaming, pornography, social media). Scores of 13 or greater (possible range: 0-6.5 [nonpathologic behavior], 7.0-13.0 [moderate, ie, abusive, addictive behavior], >13.0 [addictive behavior]) indicate IA. Cutoff scores were derived from the general population and clinically validated[12] with good diagnostic accuracy (sensitivity, 80.5%; specificity, 82.4%).

The AICA using expert evaluators (AICA-C[24]) reliably (Cronbach α = 0.9) was used to measure secondary outcomes. The AICA-C defines 6 core criteria for IA (preoccupation, loss of control, withdrawal, negative consequences, tolerance, craving) to be rated by a trained clinician on a 6-point scale (0, criterion not met; 5, criterion fully met). A cutoff score of 13 has yielded the best values on diagnostic accuracy (sensitivity, 85.1%; specificity, 87.5%).[25] The AICA-S and AICA-C instruments were adopted to assess different subtypes of internet addiction, which represents a broader concept of the disorder.

Other instruments used to evaluate the secondary outcomes included the Global Assessment of Functioning (GAF), which measures psychosocial functioning on a scale from 0 (insufficient information) to 100 (superior functioning).[26] The Structured Clinical Interview for *DSM-IV* (SCID-I and -II) was administered at t0, t2, and t3 for assessing comorbid mental

disorders. The Beck Depression Inventory-II (BDI-II[27]) assesses depressive symptoms by 21 items on 4-point Likert scales, with possible scores indicating depression of 0 to 13 (minimal), 14 to 19 (mild), 20 to 28 (moderate), and 29 to 63 (severe); in this trial, comorbid depression was indicated by a BDI-II score of 26 or higher.

In these additional assessments, only AICA-S, AICA-C, BDI-II, and GAF were administered. At t0, t1, t2, and t3, the primary and secondary end points were determined; SCID-I and SCID-II were administered at t0, t2, and t3. All evaluations were performed by independent raters blinded to the treatment condition (trained psychologists). No study allocation information was revealed to raters.

Primary and Secondary End Points

The primary end point was remission of IA based on a cutoff AICA-S score of less than 7 points.[21] Secondary outcomes were self-reported internet addiction symptoms, time spent online on weekdays, psychosocial functioning, and depression.

Safety and Adverse Events

Adverse events were defined as any significant unfavorable change in the patient's pretreatment mental condition, regardless of its relationship to treatment, particularly the occurrence of any additional mental disorder. Adverse events and serious adverse events were reported to the data safety and monitoring board. Details are available in the eResults of Supplement 2.

Statistical Analysis

Sample size calculation was based on the previous open trial with 33 patients.[21] Twenty-four patients had achieved remission according to the AICA-S cutoff score of less than 7; the dropout rate was 29.7%. A difference in the WLC group of 20% was considered clinically relevant. With a power of 90%, 184 patients are needed to detect that difference; 192 patients were planned for inclusion. To estimate the feasibility of recruitment, treatment seekers were surveyed over 1 month in all participating centers before the main study. The primary end point was remission of IA at treatment completion measured by an AICA-S score of less than 7 points. Internet addiction was analyzed by a generalized linear mixed-effects model (within and between cluster variance) with treatment status, pretreatment AICA-S score, comorbid mental disorders, study center, and age.

Secondary end points were analyzed as between-participant (STICA vs WLC) and within-participant comparisons over time. Baseline-adjusted analyses of covariance, repeated-measure analyses of covariance, 1-tailed paired and unpaired t tests, and χ^2 tests were used. Cohen d (dz values adjusted for the intercorrelations of the dependent variables) were used as effect size indicators. Expert rating of IA symptoms (AICA-C<13 points) indicating remission were analyzed as a secondary end point.

Analysis was based on the intention-to-treat population. Missing data at t2 were replaced by t1 data if available (last observation carried forward). If t1 data were not available, dropping out of the study was regarded as treatment failure. Miss-

ing data were not replaced using multiple imputations, because sensitivity analyses yielded unsatisfactory results. Findings were considered significant at $P < .05$. The statistical software used for analysis was SAS software, version 9.4 (SAS Inc) and SPSS, version 23 (IBM).

Results

Participants

As shown in Figure 1, of 187 patients assessed, 38 did not meet inclusion criteria. Thus, 149 patients were randomized (intention-to-treat). From the intention-to-treat population, 6 patients withdrew from participation, resulting in 72 patients in the STICA group and 71 patients in the WLC group. At midtreatment assessment, in STICA, 12 participants dropped out (9 in WLC), and 12 (9 in WLC) dropped out at termination. The patient distribution to the cohorts was center 1, 126 (100 included; STICA: 50; WLC: 50), center 2, 22 (19 included; STICA: 9; WLC: 10), center 3, 16 (9 included; STICA: 4; WLC: 5), and center 4, 23 (21 included; STICA: 11; WLC: 10).

Demographic and medical data did not differ significantly between STICA and WLC participants at baseline (eTable 1 in Supplement 2). Mean (SD) age was 26.2 (7.8) years (range, 17-52 years). Most participants had an advanced education (86). Almost half were in training or school, 1 in 3 was employed, and the rate of unemployment was high (27 [18.9%]). Twelve men (8.4%) were married. The main problem applications were online computer games (82 [56.6%]), online pornography (23 [16.1%]), generalized IA (29 [20.9%]), and offline computer games (9 [6.3%]). A correlation analysis revealed IA subtype and age effects as follows: online games: STICA, $r = -0.425$ ($P = .001$) and WLC, $r = -0.283$ ($P = .01$); offline games: STICA, $r = 0.113$ ($P>.05$) and WLC: $r = -0.179$ ($P>.05$); online pornography: STICA, $r = 0.347$ ($P = .002$) and WLC: $r = 0.331$ ($P = .004$); and other: STICA: $r = 0.152$ ($P>.05$) and WLC: $r = 0.140$ ($P>.05$). A total of 52.4% of the patients met criteria for at least 1 further mental disorder (mostly mild to moderate depression) according to SCID-I/SCID-II (eTable 3 in Supplement 2). Twenty-one patients (14.7%) were receiving stable regimens of psychotropic medication.

A total of 100 patients (69.9%) (STICA: 47 [65.3%]; WLC: 53 [74.6%]; $\chi_1^2 = 7.15$; $P = .01$) finished treatment as scheduled. The most frequent reasons for being classified as a dropout were lack of adherence and having missed a predefined number of therapy sessions (attended <18 of 23 sessions) (STICA: 20 [27.8%]; WLC: 14 [19.7%]).[24]

Analysis of Primary End Point

Based on AICA-S at posttreatment, 50 of patients (69.4%) receiving STICA were classified as achieving remission compared with 17 patients (23.9%) in the WLC group ($\chi_1^2 = 29.72$; $P < .001$; $\varphi = 0.456$). Generalized linear mixed-effects model with treatment status, pretreatment AICA-S score, comorbid disorders, center, and age as factors was performed to examine the primary (**Table 1**). The adjusted odds ratio for STICA vs WLC was 10.10 (95% CI, 0.69-27.65; $P < .001$). A higher AICA-S baseline score was associated with less remission.

Table 1. Primary End Point in 143 Patients: Generalized Linear Mixed Model Within and Between Cluster Variance[a]

Variable	Odds Ratio (95% CI)	P Value
Treatment		
STICA vs WLC	10.10 (3.69-27.65)	<.001
AICA-S baseline score	0.84 (0.74-0.94)	.003
Comorbidity at baseline[b]		
No vs yes	0.96 (0.61-1.5)	.61
Treatment center	1.01 (0.96-1.10)	.87
Age, y	0.80 (0.35-1.86)	.66

Abbreviations: AICA-S, subjective Assessment of Internet and Computer Game Addiction; STICA, short-term treatment for internet and computer game addiction; WLC, wait-list control.

[a] Modeled for the remission rate of the AICA-S. Patients terminating the study prematurely were modeled based on t1 (time factor, midtreatment) results (last observation carried forward).

[b] Determined according to the Structured Clinical Interview for *DSM-4* (dichotomous categorization).

Figure 2. Changes of the Mean Subjective Assessment of Internet and Computer Game Addiction (AICA-S) Scores Across Measurement Points

Comparison of short-term treatment for internet and computer game addiction group with wait-list control group. The horizontal line in the middle of each box indicates the median. The diamond within each box indicates the mean. Top and bottom borders of the box mark the 75th and 25th percentiles, respectively. The whiskers above and below the box mark the 90th and 10th percentiles. The circles beyond the whiskers are outliers. t0 indicates time factor, baseline; t1, time factor, midtreatment; t2, time factor, termination; and t3, time factor, 6-month follow-up.

There were no significant differences of baseline variables between the centers. In addition, the center had no effect on the primary or secondary outcomes.

Figure 2 shows the numeric AsignificantICA-S scores for STICA and WLC (modeled according to last observation carried forward). The greatest declines were observed at midtreatment, and these were consolidated at posttreatment for STICA with small improvements in the WLC group. Thirty-six participants (50.0%) in the STICA group were contacted 6 months after treatment termination. Of these, 29 respondents (80.6%) scored below the cutoff level for IA.
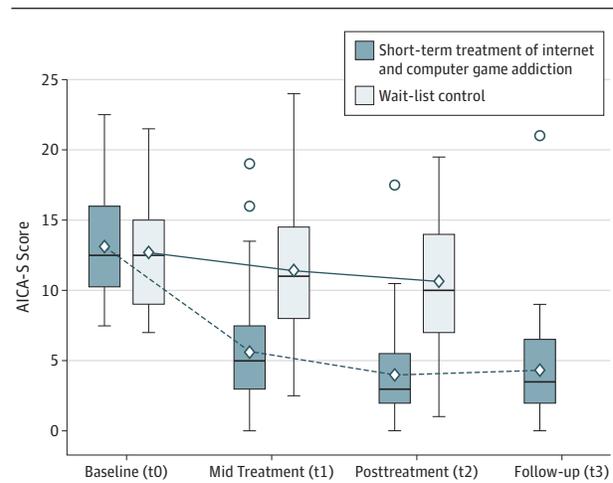
Analyses of Secondary End Points

Analysis of variance revealed significant main effects for STICA ($F_{2,90}$ = 128.64; $P \le .001$) and WLC ($F_{2,118}$ = 14.78; $P \le .001$) and interactions between time (t0, t1, t2) and treatment (STICA, WLC; $F_{2,202}$ = 33.95; $P \le .001$) for self-reported and expert-reported IA scores and time spent online on weekends **(Table 2)**. Significant main and interaction effects were also found for STICA regarding online times on weekdays ($F_{2,111}$ = 151.28; $P \le .001$) and GAF scores ($F_{2,110}$ = 17.19; $P \le .001$). Significant main effects emerged for depression (STICA: $F_{2,104}$ = 37.46; $P \le .001$; and WLC: $F_{2,118}$ = 10.80; $P \le .001$).

eTable 4 in Supplement 2 displays post hoc within-group tests, effect sizes, and between-group effect sizes. Effect size differences between t0 and t2 were in favor of STICA regarding AICA-S (1.63), AICA-C (1.37), time spent online on weekdays (1.13), time spent online on weekends 0.96, GAF score (0.61), and depression (0.38).

Discussion

To our knowledge, the data reported herein represent the first randomized clinical observer blind multicenter trial on IA.[16] Based on a theoretical model of IA, the published and successfully pretested short-term CBT (STICA[19,20]) was performed at 4 different sites We included a male sample (mean age, 26 years; range, 17-52 years) with addictive online and offline gaming or IA. These behaviors address domains beyond the Gaming Disorder Category, which will also be provided by upcoming *International Classification of Diseases, 11th Revision*; nonetheless, these share the understanding of behavioral disorders.[3] A total of 52.4% of the patients had comorbid mental disorders (mostly mild to moderate depression), and 14.7% were receiving stable regimens of psychotropic medication.

Monitored by the Interdisciplinary Center for Clinical Trials, we randomized 143 patients to STICA or WLC. The primary end point was remission according to AICA-S.[12,21] Even though the sensitivity and specificity of the AICA-S[12] and AICA-C[25] are sufficient, the AICA-C[25] has a small advantage in detecting internet gaming disorder. Nonetheless, AICA-S[21] was predefined as the primary outcome of this study.[24] Based on intention-to-treat analyses, at termination, 69.4% of the STICA group achieved remission vs 23.9% of the WLC. The odds ratio for remission was 10.10 in favor of STICA.

The STICA group showed strong pre-post effect size differences at treatment termination compared with the WLC group on self-reported IA symptoms (d = 1.19), time spent online (d = 0.88), and psychosocial functioning (d = 0.64). Pre-post effect sizes for depression were high in STICA (d = 0.90); however, as depression also was reduced in WLC, differences between STICA and WLC were not significant.

Self-report data were confirmed using external ratings by trained professionals blinded to the treatment condition. Analyses of AICA-C, a validated checklist,[25] confirmed a significant decrease of IA symptoms in the STICA compared with the WLC group with a large effect size (d = 0.80).

Table 2. Changes of Symptoms Over Time in STICA (n = 72) vs WLC (n = 71) Participants[a]

End Point	Measurement Point, Mean (SD)			Main Interaction Effect	
	t0	t1	t2	F Value[b]	P Value
AICA-S					
STICA	13.1 (3.83)	5.7 (3.99)	4.6 (3.46)	$F_{2,90} = 128.64$	≤.001
WLC	12.7 (4.14)	11.4 (4.70)	10.5 (4.33)	$F_{2,118} = 14.78$	≤.001
Interaction (time × treatment)				$F_{2,202} = 33.95$	≤.001
AICA-C[c]					
STICA	18.6 (4.9)	8.3 (5.5)	6.3 (6.3)	$F_{2,111} = 151.28$	≤.001
WLC	18.6 (5.8)	15.9 (7.4)	13.6 (8.1)	$F_{2,103} = 11.92$	≤.001
Interaction (time × treatment)				$F_{2,231} = 19.88$	≤.001
Time Spent Online (weekday), h/d					
STICA	6.5 (3.11)	3.4 (3.03)	3.0 (2.21)	$F_{2,11} = 46.66$	≤.001
WLC	5.8 (3.14)	5.8 (3.29)	5.7 (3.09)	$F_{2,51} = 0.61$	.67
Interaction (time × treatment)				$F_{2,228} = 15.74$	≤.001
Time Spent Online (weekend), h/d					
STICA	8.4 (3.91)	4.1 (2.82)	3.6 (2.57)	$F_{1.7,96.7} = 59.25$	≤.001
WLC	7.6 (3.73)	5.6 (3.43)	5.1 (3.17)	$F_{2,118} = 7.51$	.001
Interaction (time × treatment)				$F_{2,230} = 2.89$	≤.001
GAF[d]					
STICA	69.3 (10.00)	75.7 (8.93)	76.4 (10.40)	$F_{2,110} = 17.19$	≤.001
WLC	69.5 (9.52)	70.6 (9.25)	69.5 (9.73)	$F_{2,118} = 0.89$	.412
Interaction (time × treatment)				$F_{2,228} = 9.26$	≤.001
BDI-II					
STICA	13.9 (9.54)	8.1 (8.35)	5.8 (7.24)	$F_{2,104} = 37.46$	≤.001
WLC	15.4 (8.73)	15.0 (9.64)	12.3 (8.97)	$F_{2,118} = 10.80$	≤.001
Interaction (time × treatment)				$F_{2,230} = 2.61$	.08

Abbreviations: AICA-C, Assessment of Internet and Computer game Addiction Checklist; AICA-S, subjective Assessment of Internet and Computer Game Addiction scale; BDI-II, Beck Depression Inventory II; value (analysis of variance); GAF, Global Assessment of Functioning; STICA, Short-term Treatment for Internet and Computer Game Addiction (treatment group); WLC, wait-list control.

[a] Total of 143 participants evaluated in last observation carried forward; analysis of variance with factors time (t0, t1, t2) and treatment (STICA, WLC); t0, baseline; t1, midtreatment; t2 termination.

[b] Determined with analysis of variance.

[c] Possible score range: 0 to 6.5 (nonpathologic behavior), 7.0 to 13.0 (moderate, ie, abusive, addictive behavior), and greater than 13.0 (addictive behavior) indicating IA.

[d] Measures psychosocial functioning on a scale from 0 (insufficient information) to 100 (superior functioning).

To compare findings with the meta-analysis,[17] we also computed pre-post treatment effect sizes for completers (n = 100). These exceeded the previously reported effects (g = 1.48). In favor of STICA, we found pre-post effect sizes of d = 2.57 for AICA-S, d = 1.05 for time spent online on a weekday, d = 1.47 response at weekends, and d = 1.10 for BDI-II. Completers and noncompleters did not differ significantly in baseline variables except for time spent online on a weekday.

Despite the heterogeneity of the treatment group, we found that our CBT program was effective across this range, regardless of age, comorbidity, or treatment center. These findings support a unitary concept of IA and point to the flexibility of the STICA.[19,20] Patients seeking treatment for different subtypes of IA represent the study population. Consideration of IA as a broad dysfunction has been controversial.[4,5] In this study, treatment efficacy within all subtypes of IA supports a broader concept of IA.

We found many of the patients to be ambivalent toward engaging in and completing treatment. This resistance indicates a core characteristic of IA-affected patients. Given their low level of conscientiousness and the high level of negative affectivity,[28] we found it necessary to promote treatment motivation. The group intervention appeared to be helpful to engage patients emotionally, with an opportunity to reflect on cognitive distortions and obtain support from group members. We found that several patients became depressed over the course of the trial, and a few needed to be transferred to inpatient psychotherapy. This finding concurs with our clinical experience that, in some cases, reduction of the addictive online behavior may also destabilize emotional self-regulation. Given the often pervasive and chronic maladjustment (eg, high unemployment in this well-educated group), deficient self-regulation, social insecurity, and anxiety,[12,28,29] we supplemented group with individual treatment sessions to monitor depressive and other psychopathological symptoms and provide crisis intervention.[24]

When the trial started, there was no alternative treatment available; thus, we used a WLC, giving participants the option to obtain treatment with a delay of 15 weeks. Participation in the WLC had small to moderate effects regarding IA, time spent online, general functioning, and depression. These effects underscore the necessity to include a control group, and we surmise that previous pre-post analyses have overestimated treatment effects.[17] Although we cannot preclude spontaneous remission, we would argue that inclusion in the trial with repeated assessment contacts and the prospect of future treatment probably provided structure, motivation, and hope for change, which may have accounted for improvements in the WLC.

Limitations

Several limitations should be addressed. Pre-post comparisons may have overestimated the effect of this intervention. The pace of recruitment was slower than expected, as we could randomize only when a sizable number of patients was recruited. Some patients dropped out before randomization. Thus, we were not able to reach the planned number of participants. We therefore needed an extended recruitment time with smaller group sizes. However, the statistical power was sufficient to detect differences in the end points accurately.

In this randomized clinical trial, we used self-report as a primary end point. While AICA-S is a validated self-assessment for IA, an externally assessed (clinical) rating might confer higher clinical validity as a primary end point.

Because participants were limited to men to reflect the preponderance of male treatment seekers, results cannot be generalized to female patients. While recent epidemiologic surveys have shown almost no sex differences regarding the prevalence of IA,[30] female patients with IA are seldom represented in the help system. Therefore, further clinical trials are needed to evaluate the effectiveness of STICA in females.

Research has demonstrated that IA is associated with high rates of comorbidity.[14] Although we controlled for the effects of comorbidity, we had to define exclusion criteria for some of these conditions (eg, major depression, some personality disorders). Thus, the clinical sample is probably not fully representative of the entire population of patients with IA.

Consistent with a systematic review by Brorson and colleagues[31] on dropout rates of young adults in addiction treatment (23%-50%), dropout rates were considerable in our sample. In case of missing t3 data, we did not use t2 data via last observation carried forward. Owing to high dropout rates at t3, the stability of the findings need further testing. Thus, follow-up assessment 6 months after the end of treatment cannot be interpreted. Future studies should put a clear emphasis on collecting follow-up data and implement efficient strategies to ensure higher response rates. There is a necessity to put further efforts in strengthening the patients' commitment, by, for example, elaborating on strategies for enhancing the motivation to change before the start of treatment. The WLC group received no follow-up measure, since the start of treatment would have been prolonged for 10 months from randomization, which was considered unacceptable for ethical reasons. We decided to include a WLC owing to the lack of empirically evaluated alternative treatment programs (ie, treatment as usual) for IA at that time. However, a WLC contains limitations (eg, the risk of inflating estimations on therapy effects).

Conclusions

Future trials should consider the effects of accompanying medication on IA. There are some data on the effects of pharmacotherapy in IA.[17] Combining CBT and pharmacotherapy could lead to augmented effects. The study shows that STICA can be effective in treatment of IA. Thus, STICA might be used as a benchmark as a nonpharmacologic intervention and serve as a treatment as usual condition in upcoming trials.

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