Alcohol use disorder treatment via video conferencing treatment compared with in-person therapy during COVID-19 social distancing measures: a non-inferiority comparison of three cohorts

Beurs, E. de; Rademacher, C.; Peen, J.; Blankers, M.; Dekker, J.

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RESEARCH ARTICLE

Alcohol use disorder treatment via video conferencing compared with in-person therapy during COVID-19 social distancing : A non-inferiority comparison of three cohorts

Edwin de Beurs[1,2] | Clara Rademacher[1] | Matthijs Blankers[2,3,4] | Jaap Peen[2] | Jack Dekker[2,5] | Anneke Goudriaan[2,6,7]

[1]Department of Clinical Psychology, University of Leiden, Leiden, The Netherlands

[2]Arkin GGZ, Amsterdam, The Netherlands

[3]Department of Psychiatry, University of Amsterdam, Amsterdam, The Netherlands

[4]Trimbos Institute, Utrecht, The Netherlands

[5]Department of Clinical Psychology, Vrije Universiteit, Amsterdam, The Netherlands

[6]Amsterdam Institute for Addiction Research, Amsterdam, The Netherlands

[7]Department of Psychiatry, Amsterdam University Medical Center, University of Amsterdam, Amsterdam, The Netherlands

Correspondence
Edwin de Beurs, Stichting Arkin GGZ, Klaprozenweg 111, 1033 NN Amsterdam, The Netherlands.
Email: edwin.de.beurs@arkin.nl

Abstract

Background: Social distancing measures during the COVID-19 pandemic forced an abrupt transformation of treatment delivery for mental health care. In mid-March 2020, nearly all in-person contact was replaced with video conferencing. The pandemic thus offered a natural experiment and a unique opportunity to conduct an observational study of whether alcohol use disorder treatment through video conferencing is non-inferior to in-person treatment.

Methods: In a large urban substance use disorder treatment center in the Netherlands, treatment evaluation is routine practice. Outcome data are regularly collected to support shared decision making and monitor patient progress. For this study, pre-test and post-test data on alcohol use (Measurements in the Addictions for Triage and Evaluation), psychopathology (Depression Anxiety Stress Scales), and quality of life (Manchester Short Assessment of Quality of Life) were used to compare outcomes of cognitive behavioral therapy treatment for three cohorts: patients who received treatment for a primary alcohol use disorder performed prior to ($n = 628$), partially during ($n = 557$), and entirely during ($n = 653$) the COVID-19 lockdown.

Results: Outcome was similar across the three cohorts: No inferior outcomes were found for treatments that were conducted predominantly through video conferencing during lockdown or treatments that started in-person, but were continued through video conferencing, compared to in-person treatments that were conducted prior to COVID-19. The number of drop-outs were also similar between cohorts. However, there was a difference in average treatment intensity between cohorts, with treatment partially or fully conducted during the COVID-19 pandemic lasting longer.

Conclusions: Treatment for a primary alcohol use disorder, provided partially or predominantly through video conferencing during the COVID-19 pandemic resulted in abstinence rates and secondary outcomes similar to traditional in-person care, in spite of the potentially negative effects of the COVID-related lockdown measures

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themselves. These results from everyday clinical practice corroborate findings of randomized controlled studies and meta-analyses in which video conferencing appeared non-inferior to in-person care in clinical effectiveness.

KEYWORDS
alcohol use disorder, COVID-19, eHealth, video conferencing

INTRODUCTION

The outbreak of the COVID-19 pandemic in 2019 brought about a worldwide emergency (Yang et al., 2020) and by the end of May 2022, more than 525 million cases and more than 6 million deaths were attributed to the crisis globally (World Health Organization, 2022). Measures such as self-quarantining, isolation, and social distancing were instigated to reduce in-person contact and, consequentially, the spread of the virus (Nussbaumer-Streit et al., 2020). In mental health care provision, this meant a change from in-person to remote treatment using the means of telehealth (Humer & Probst, 2020). Telehealth is defined as the use of communication technology to provide healthcare treatment over a distance (Doraiswamy et al., 2020). Treatment can, for example, take place via telephone and/or video and video conferencing in particular was implemented as an alternative to in-person treatment in the Netherlands (Oudshoorn et al., 2021). Telehealth treatment has the clear advantage of making treatment accessible when it would usually not be accessible due to travel costs, a lack of practitioners, distance, or social distancing measures resulting from the COVID-19 crisis. Patients are generally satisfied with telehealth treatment (de Beurs et al., 2021a), and it is recognized as an effective alternative to conventional in-person treatment (Lin et al., 2019). However, the uptake of telehealth by professionals in MHC has been slow (Chakrabarti, 2015).

The research body on the effectiveness of treatment of psychiatric disorders by means of video conferencing is promising: Meta-analyses indicate that video conferencing treatment targeting symptom reduction is non-inferior to in-person treatment (Drago et al., 2016; Norwood et al., 2018). Similarly, video conferencing treatment was shown to help individuals with substance use disorders (SUDs) to reduce their substance use to a similar extent compared to individuals treated in-person (King et al., 2014). Yet, the uptake of video conferencing treatment in routine practice is slow in SUDs treatment as well (Molfenter et al., 2021). Examples of barriers for the implementation of this treatment modality are practitioners' low confidence in their own abilities to use technology (Vaitheswaran et al., 2012), too little attention for the positive cost–benefit ratio (Vaitheswaran et al., 2012) and administrative problems, such as maintaining records and the coordination of schedules (Grady, 2012). In addition, a study comparing the endorsement of different Internet treatment modalities found that psychologists generally provided low levels of endorsement for the use of internet-based therapies (Mora et al., 2008). They did, however, prefer the use of video conferencing as an alternative to in-person treatment over the use of other Internet-based therapies and the authors speculate that a growing evidence base for this treatment modality may increase psychologists' endorsement level in the future (Mora et al., 2008). We conducted a comprehensive survey among therapists of our clinic on their experiences with e-health in the first months of the COVID-19 pandemic and found mixed results: Therapists in curative care were mostly positive and welcoming to this new treatment modality; therapists of patients with severe mental illness were more hesitant (de Beurs et al., 2021b).

Video conferencing treatment may be especially relevant for SUDs (including alcohol use disorder, AUD), as for these disorders the widest treatment gap is reported between affected individuals and individuals who are actually treated (Degenhardt et al., 2017). AUDs are serious conditions with a mean lifetime prevalence of around 10% (Glantz et al., 2020) and approximately 3 million alcohol-attributed deaths in 2018 (World Health Organization, 2019). Many individuals affected by AUD do not commence treatment because of inaccessibility of treatment options (Zewdu et al., 2019). Increased use of video conferencing treatment may help to overcome this barrier to AUD treatment (Johansson et al., 2021).

Similar to the existing research on the comparison between video conferencing treatment and in-person treatment, there is convincing evidence for the effectiveness of video conferencing treatment in general (de Beurs et al., 2022) and for AUD in particular: Tarp et al. (2017) found no differences in treatment outcome for AUD between regular in-person treatment and in-person treatment with some of the sessions conducted in video conferencing format (so called "blended treatment"). A systematic review supports these findings, by demonstrating that there is no difference in treatment outcome of alcohol consumption between in-person treatment and video conferencing treatment (Byaruhanga et al., 2020). In their non-inferiority trial, Johansson et al. (2021) found that internet therapy was non-inferior to in-person therapy for the difference in alcohol use at 6-month follow-up. Other forms of eHealth, such as guided or unguided self-help programs or blended forms of in-person and e-health treatments have also shown to be effective for AUD as primary disorder (O'Connor et al., 2018) or as comorbid condition (Schouten et al., 2021). In the present study, we focused on video conferencing treatment, as this modality of treatment provision was dominant after the COVID-19-related measures were ordained. The COVID-19 measures offered a good opportunity to conduct an observational study in order to assess whether video conferencing is non-inferior to in-person treatment in everyday clinical conditions. It is important to establish whether the promising effects of

video conferencing treatment for AUD (Johansson et al., 2021; Lin et al., 2019) and other patient populations (King et al., 2014; Norwood et al., 2018; Vogel et al., 2014) as reported in randomized controlled trials hold up in routine practice. When it comes to drawing causal inferences about the relationship between treatment modality and outcome, the recommended approach is to use a randomized controlled trial (RCT). An observational study can show whether video-conferencing treatment is non-inferior to in-person therapy in everyday clinical practice. In a previous Dutch observational study of the effectiveness of video conferencing treatment for common mental disorders, such as depression and anxiety disorders, no differences in outcomes were found (de Beurs et al., 2022). It is important to investigate whether this holds as well for the treatment of AUD. Beneficial results of video conferencing treatment may help to lift the barrier of its implementation in routine practice.

The aim of the current study was to investigate whether video conferencing treatment, as delivered under COVID-19 measures, delivers non-inferior results regarding post-treatment alcohol use among outpatients with AUD in comparison to the results of in-person treatment prior to COVID-19. We hypothesize a non-inferior outcome for treatments that were conducted (partially) via video conferencing as compared to in-person treatments.

METHODS

Sample

The current study made use of a convenience sample ($N = 838$) of patients who were diagnosed with AUD. Only participants who started and ended outpatient treatment between January 1, 2019 and December 31, 2021 were included in the study. The mean age of participants was 46 years and 27.8% of participants identified as female. The mean treatment length of participants was about 7 months ($M = 221.8$ days; SD = 87.6). The mean number of treatment contacts was $M = 46.7$ (SD = 57.9). The data used in this study are exempt from an informed consent procedure under Dutch law, as it concerns anonymized data collected routinely to contribute to shared decision making, outcome monitoring, and quality control. Nevertheless, prior to treatment, patients were asked to permit the use of their anonymized data for research.

The sample was divided into three cohorts, relative to the date that COVID-19 lockdown restrictions were implemented in the Netherlands (the 16th of March 2020). From then on, all ambulatory treatments were performed through video conferencing. The first cohort comprised of clients who had started and completed treatment prior March 16th, the date that COVID-19 restrictions were implemented and who had received predominantly in-person treatment (pre-COVID-19). The second cohort consisted of clients that had started prior to March 16th and ended after March 16th. Their treatment took partially place during COVID-19 restrictions. These clients had started their treatment receiving in-person treatment, but continued treatment in video conferencing format from March 16th onwards (partially-COVID-19). Lastly, the third cohort contained clients who had started treatment after March 16th during COVID-19 restrictions as video conferencing treatment and continued till May 2021, the last post-test assessment that was included in the study. As restrictions were lowered in June 2020, for some patients in this group, later treatment sessions were delivered again in-person (entirely-COVID-19). The three cohorts relative to a timeline with the date of the start of the COVID-19 social distancing measures are shown in Figure 1.

Dropouts and missing post-test data are shown in Table 1. The table shows for each cohort, the initial sample, the dropouts, missing post-test data, and the participants with complete ROM

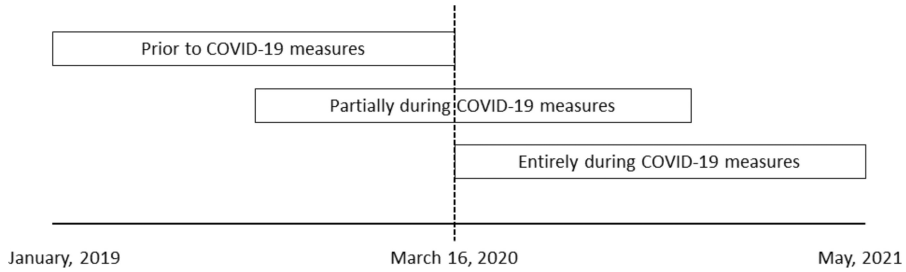

FIGURE 1 The three cohorts relative to a timeline with the start date of the COVID-19 social distancing measures.

TABLE 1 Composition of the three treatment cohorts.

	Prior to COVID		Partially during COVID		Entirely during COVID		Total
	N	%	*N*	%	*N*	%	*N*
Pre-test available	628		557		653		1838
Dropout	172	27.4	94	16.9	151	23.1	417
No post-test	181	28.8	198	35.5	204	31.2	583
Post-test available	275	43.8	265	47.6	298	45.6	838

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data. For a substantial group of patients, no complete ROM assessments were available. In the comparison of cohorts, only completed treatments with post-test data on alcohol use were included, which made up 45.6% of the initial clients with pre-test data. A comparison of pre-test characteristics of patients with and without post-test data was made to check for selective ROM non-response.

Setting and procedure

The study was performed on data from several outpatient treatment centers of Jellinek, a SUD treatment center, and a subdivision of the mental health care institute Arkin in the Netherlands. The main treatment centers of Jellinek are situated in Amsterdam, Amersfoort, and Utrecht and provide care in urban and local areas. The Jellinek clinic is a specialty clinic for the treatment of substance use disorders and gambling addiction. It is registered as a TOP-clinical facility, a quality indicator reserved for about 5% of SUD treatment providers in the Netherlands. It offers about 5% inpatient and 95% outpatient treatment (but not court-ordered treatment which is provided at our forensic facility). Treatment is predominantly provided by master level and post-academically educated clinical psychologists. Treatment was provided in the form of cognitive behavioral therapy (CBT) for addiction and was administered by CBT-trained professionals.

This study followed a longitudinal observational design. The assessments were made through Routine Outcome Monitoring (ROM; de Beurs et al., 2011), which tracks treatment outcomes of participants by measuring symptoms throughout the treatment, at periodic time points. The periodic ROM assessments may vary in frequency, for example, from session-to-session (Lambert, 2010; Miller et al., 2005), every few weeks or months (de Beurs et al., 2011), or may be limited to a baseline and post-test or follow-up assessment (Tiet et al., 2006). The approach with periodic assessment is applied in the Jelinek clinics, where clients are assessed every 3–4 months. ROM was used to measure participants' alcohol use, levels of self-reported depression, anxiety and stress, and quality of life. The measurement instruments used in ROM are described in the measures section. For the present study, pre-test and post-test assessments of the ROM evaluations closest to the clients' first and last treatment sessions were selected.

Measures

All clients were diagnosed according to the DSM-5 (American Psychiatric Association, 2013) criteria and met criteria for AUD. General functioning at pre-test was assessed with the global assessment of functioning (GAF) scale (Endicott et al., 1976) of the DSM-IV. Data on premature treatment termination (drop-out) were derived from patients' electronic records, where therapists register the time and reason for discontinuation of treatment.

Primary outcome

The primary outcome of the study was alcohol use at post-test in five levels: (1) abstinence, (2) low-risk use, or (3) diminished use versus (4) stable or (5) increased high-risk use or in two levels (1–3 vs. 4–5). Alcohol use was measured with the Measurements in the Addictions for Triage and Evaluation (MATE 2.1; Buchholz et al., 2009; Schippers et al., 2010), module 1, which assesses the total number of standard drinks consumed during the previous 30 days through an interview with the client. The MATE works with units of standard drinks, a beer glass (250 mL), wine glass (100 mL), or spirits (30 mL), all corresponding to 10 g or 12.5 mL of alcohol. The instrument has acceptable reliability and good validity indicators (Schippers et al., 2010). Patients were asked at pre-test about their alcohol use in the 30 days prior to the assessment date. The total number of units used and the number of days of use were assessed. In the MATE, a distinction is made between days with excessive use (> 30 g of alcohol per day for women and >40 g for men) and days of limited use (up to 30 g for women and up to 40 g for men). Abstinence was defined as 0 days of use, low-risk use as only days of limited use, and high-risk use as one or more days of excessive use in the 30 days prior to the assessment. At post-test, the same criteria were applied (see Table 3, categorical outcome). Furthermore, the category of excessive use was further subdivided in ≥40% reduction in use, stable use, and ≥40% increase in use compared to the pre-test, yielding five outcome categories as shown in Table 3. Treatment was deemed successful if the patient was either abstinent, reported low-risk use, or reported ≥40% reduction in high-risk use (Oudejans & Deenik, 2015) (see Table 3, binary outcome).

Secondary outcomes

Secondary treatment outcome was severity of general psychopathology, as operationalized by the short form of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995). This instrument has 21 items and good reliability and validity indicators for the English (Lovibond & Lovibond, 1995) and Dutch version (de Beurs et al., 2001). The DASS-21 was administered as part of the MATE module Q2 to measure psychopathology symptoms at pre- and post-test. Finally, treatment outcome was assessed with the Manchester short assessment of quality of life (MANSA) (Priebe et al., 1999). This questionnaire measured the participants' overall quality of life and comprises of 16 items with good reliability and validity indicators for the English (Priebe et al., 1999) and also for the Dutch version (van Nieuwenhuizen et al., 2017).

Statistical analysis

First, tests of normality, homogeneity of within group variance/covariance matrices, and sphericity of all dependent variables were conducted. Next, a check for selective ROM non-response

at post-test was performed by comparing participants with missing post-test data to participants with complete data on the variables, age, pre-test severity, general functioning, and gender. To test for a gender difference, a χ^2 test was used; we tested for differences in age, pre-test alcohol use, general functioning, with one-way analyses of variance (ANOVA) or Kruskal–Wallace tests. Similarly, a check for pre-existing differences between the three cohorts was performed through χ^2 tests for gender and ANOVAs or Kruskal–Wallace tests for age, pre-test alcohol use, severity of psychopathology, quality of life, and general functioning.

Non-inferiority limit

To test the hypothesis of non-inferiority, a non-inferiority limit was chosen. According to Piaggio et al. (2012), the non-inferiority limit should be based on the effect of a comparator, which in this case is the effect of CBT for alcohol or other drug use disorders compared to no intervention (Magill et al., 2019). The margin was calculated with the fixed-margin method (Angeli et al., 2020) and, following the guidelines of the Food and Drug Administration (2016), a preserved effect of 50% of the lower margin of the 95% CI. In a study with a similar design as the present comparison, Johansson et al. (2021) followed these recommendations and set the limit to five standard drinks for alcohol consumption. In contrast, Wallace et al. (2017) applied a more stringent limit of 10% with a binary outcome indicator of alcohol use, when comparing the proportions of harmful and hazardous drinkers in their study. To be sufficiently protected against an erroneous conclusion of non-inferiority, the limit in the present study was also set to the more stringent 10% for the primary outcome variable. Consequently, the difference in the proportion of substantial drinkers between the cohorts should not exceed 10% in order to conclude non-inferiority. In addition, the criterion recommended by Johansson et al. (2021) of a difference in number of standard drinks <5 was also applied to the data.

To further investigate whether the proportion of substantial drinkers at post-test was different between cohorts, a χ^2 test was carried out. Cohorts were also compared regarding the number of early terminators of treatment (dropouts). Dropout was defined as treatment termination initiated by the patient. Finally, we compared treatment length, assessed by comparing the dates of the first and last treatment session and the number of sessions between cohorts.

As secondary analyses, repeated measures ANOVAs were performed with time as within factor and cohort as between factor on DASS-21 and MANSA total scores. The relevant time by cohort interaction is reported.

RESULTS

As Table 1 shows, initially, pre-test data were available for $N=557$ to $N=652$ patients per cohort. No post-test was available for 28.8%–35.5% of each cohort, a proportion that did not differ significantly between the cohorts [$\chi^2(2)=1.71$; $p=0.43$]. We also assessed the number of patients who terminated treatment early on and completed no post-test assessment. The proportion of dropouts was higher in the pre-COVID cohort, and lower in the partially COVID cohort [$\chi^2(2)=18.71$; $p<0.001$].

The comparison of included patients ($n=838$) to not included patient (due to drop-out or due to missing post-test data ($n=999$) revealed no difference on gender $\chi^2(1)=0.32$; $p=0.57$), but significant differences on the variables age ($t(1835)=1.97$; $p<0.05$, $d=0.09$; included patient were slightly older), pre-test severity (DASS, lower for included patients) ($t(1258)=3.79$; $p<0.001$, $d=0.21$), global functioning (GAF, functioning higher for included patients) at baseline/start of treatment ($t(1761)=3.85$; $p<0.001$; $d=0.18$). The Cohen d statistics indicate small effect sizes, as stated by guidelines (Cohen, 1988).

The comparison of the three cohorts on gender, age, pre-test use, severity of psychopathology, quality of life, and functioning, only showed a significant difference in number of alcohol use days ($F(2)=3.48$; $p<0.03$). A post hoc Tukey test revealed that pre-test use was higher in the cohort during-COVID-19 as compared to the other cohorts.

Table 2 also shows significant differences in treatment length and number of sessions between the cohorts: Treatments concluded prior to the COVID-19 pandemic were shorter and included less sessions.

Table 3 shows post-test means on continuous outcome measures and number of patients and proportions on categorical outcomes. The test results of Chi-square test, Anova's or Kruskal–Wallace tests and p-values, comparing the three cohorts at post-test are presented in Table 3 as well. For binary outcome, it shows that 18.2% of clients in the pre-COVID-19 group were categorized with high-risk alcohol use at post-test. The percentages of those with high-risk use in the partially COVID-19 group and in the entirely-COVID-19 group were 16.2% and 14.8%, respectively. As mentioned earlier, the non-inferiority limit of the current study was set to 10%, implying that non-inferiority of video conferencing treatment to in-person treatment can be concluded, as the proportions of substantial users among the three cohorts did not differ by more than 10%. Moreover, the proportion of high-risk use being actually higher in the pre-COVID-19 cohort compared to the other two cohorts, further demonstrates the non-inferiority of the two cohorts receiving partially or predominantly video-conferencing treatment. Regarding the mean number of units per week the difference between cohorts was larger than 5 units, the non-inferiority limit proposed by Johansson et al. (2021), but in the direction of more favorable results for the cohorts receiving video-conferencing treatment.

Table 4 shows pre- and post-test scores on the DASS and MANSA for the three cohorts. For DASS scores, the assumption of normality was violated, due to a positively skewed distribution of the post-test scores ($z=1.57$). Nevertheless, a mixed design two-way repeated measures ANOVA was carried out as ANOVA is considered a robust test for this violation (Schmider et al., 2010). The results

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TABLE 2 Pre-test differences between the three treatment cohorts ($N = 838$): patient and treatment characteristics.

	Prior ($n = 275$)		Partially ($n = 265$)		Entirely ($n = 298$)			
	N	%	*N*	%	*N*	%	χ^2	*p*
Female gender	76	27.6	72	27.2	91	30.5	0.94	0.63
	M	SD	*M*	SD	*M*	SD	*F*(2)	
Age	45.4	13.2	46.7	13.1	46.5	13.2	0.84	0.43
Number of units per week[a]	60.2	46.4	60.4	53.0	64.4	51.2	0.65	0.52
	Med	IQR	Med	IQR	Med	IQR	*U*(2)	
	46	60	51	60	56	57	1.77	0.41
	M	SD	*M*	SD	*M*	SD	*F*(2)	
Number of use days	20.8	9.4	20.5	9.7	21.8	9.3	1.36	0.26
Limited use days	16.1	9.7	16.2	10.1	16.4	10.6	0.08	0.92
Excessive use days	4.7	6.4	4.3	6.6	5.3	8.1	1.45	0.24
DASS-21	39.6	26.6	39.8	26.7	36.5	26.1	1.01	0.37
MANSA	56.0	13.2	56.0	13.4	57.7	13.4	1.10	0.33
GAF-score	58.4	6.9	57.6	6.9	57.1	6.2	2.67	0.07
	M	SD	*M*	SD	*M*	SD	*F*(2)	
Treatment								
Duration	180	74	267	81	219	86	79.06	0.001
Number of sessions	33.6	38.7	58.3	2.34	48.4	58.5	12.87	0.001

Abbreviations: DASS-21, Depression Anxiety Stress Scale (21 item version); *F*(df), ANOVA test statistic; GAF-score, Global Assessment of Functioning (DSM-IV); IQR, interquartile range; *M*, mean; MANSA, Manchester Short Assessment of quality of life; Med, median; SD, standard deviation; *U*(df), Kruskal–Wallace test statistic.

[a]Based on the 30 days estimate divided by 30/7.

of the repeated measures ANOVA demonstrated a time effect ($F(1, 456) = 264.09$; $p < 0.001$, partial $\eta^2 = 0.367$), which means that on average clients improved. No group effect ($F(2, 456) = 0.446$; $p = 0.640$, partial $\eta^2 = 0.002$) and no group-by-time interaction ($F(2, 456) = 0.05$; $p = 0.950$; partial $\eta^2 = 0.000$) were found.

For the MANSA, a main effect of time was found by the repeated measures ANOVA ($F(1, 416) = 248.70$; $p < 0.001$, $\eta^2 = 0.374$), meaning that the quality of life of the clients improved, irrespective of cohort. The analysis did not demonstrate a main effect of group ($F(2, 416) = 1.92$, $p = 0.149$, $\eta^2 = 0.009$), nor a group-by-time interaction effect ($F(2, 416) = 0.69$; $p = 0.504$, $\eta^2 = 0.003$).

DISCUSSION

Main findings

In the main analysis non-inferiority of the video conferencing treatment modality was formally and clearly demonstrated and this result was also illustrated by the lack of substantial differences in outcome between the cohorts, on both the primary outcome of alcohol use and the secondary outcomes. The three cohorts had similar abstinence rates, there were no differences in the decrease in alcohol use among the cohorts, a similar decline of psychopathology, and a similar increase in quality of life was attained in the cohorts. The few differences between the cohorts that emerged regarding outcomes, pointed in the direction of superior outcomes for treatments conducted through video conferencing, rather than inferior ones. Finally, the number of early treatment terminators (dropouts) did not differ among the cohorts.

This finding of noninferior outcomes for video conferencing therapy was especially striking, if we take into account that conditions for its implementation in the midst of the COVID crisis were far from ideal: The transition was unplanned and sudden, professionals had not been trained in this treatment delivery mode, and had no previous experience with the software that was used; the latter also applied to the clients. Surveys among our professionals (de Beurs et al., 2021b) and clients (de Beurs et al., 2021a) revealed that initially there were indeed problems with the use of video conferencing software. However, apparently these initial problems—that were present in the first few weeks of COVID measures—did not lead to a diminished effectiveness of the treatment thus provided.

The delivery of treatment through video conferencing did not yield higher rates of one-sided termination of treatment by the patient. In contrast, the dropout rate was somewhat higher in the pre-COVID-19 cohort. This higher dropout rate might have been due to patients not wanting to continue their treatment through video conferencing. In an additional analysis, we investigated the number of dropouts per month for the entire sample and this remained stable over time. Thus, there was no spike in dropouts around 20 March 2020, which would have explained the higher proportion of dropouts in the Prior to COVID-19 cohort. Furthermore, in the

TABLE 3 Outcome of substance use at post-test in the three cohorts ($N = 838$).

	Prior		Partially		Entirely			
Continuous outcome	***M***	**SD**	***M***	**SD**	***M***	**SD**	***F*(2)**	***p***
Number of units per week[a]	46	96	40	111	36	82	0.80	0.99
	Med	**IQR**	**Med**	**IQR**	**Med**	**IQR**	***U*(2)**	
	0.5	5.6	0.3	4.4	0.5	5.6	0.23	0.89
	M	**SD**	***M***	**SD**	***M***	**SD**	***F*(2, 835)**	
Number of use days	6.3	9.5	5.8	9.1	5.7	8.8	1.43	0.24
Limited use days	5.2	8.4	4.6	7.9	4.9	8.2	0.25	0.78
Excessive use days	1.2	3.3	1.2	3.5	0.8	2.3	2.70	0.07
Categorical outcome	***N***	**%**	***N***	**%**	***N***	**%**	χ^2**(8)**	
Abstinence	123	44.7	125	47.2	138	46.3	8.65	0.37
Low-risk use	102	37.1	97	36.6	116	38.9		
High-risk use								
Diminished	12	4.4	12	4.5	12	6.4		
Unchanged	32	11.6	22	8.3	22	7.4		
Increased	6	2.2	9	3.4	3	1.0		
Total	275	100.0	265	100.0	298	100.0		
Binary outcome	***N***	**%**	***N***	**%**	***N***	**%**	χ^2**(2)**	
Abstinence or low-risk use	225	81.8	222	83.8	254	86.2	1.23	0.54
High-risk use	50	18.2	43	16.2	44	14.8		
Total	275	100.0	265	100.0	298	100.0		

Abbreviations: *F*(df), test statistic of repeated measures ANOVA for the interaction of group*time; IQR, interquartile range; *M*, mean; Med, median; *p*, *p*-value; SD, standard deviation; *U*(df), Kruskal–Wallace test statistic; χ^2(df), chi-square statistic.

[a]Based on the 30 days estimate divided by 30/7.

TABLE 4 Pre- and post-test means and SD for the secondary outcome measures and the repeated measures ANOVA group*time interaction effect.

	Prior		Partially		Entirely			
	M	**SD**	***M***	**SD**	***M***	**SD**	***F*(2,456)**	***p***
DASS-21 pre-test	37.4	25.5	38.0	25.8	35.6	24.6	0.05	0.95
DASS-21 post-test	19.9	19.8	20.5	21.9	18.8	18.2		
MANSA pre-test	56.5	12.9	56.8	12.2	58.7	13.1	0.69	0.50
MANSA post-test	64.3	12.3	63.5	12.5	66.5	11.4		

Abbreviations: DASS-21, Depression Anxiety Stress Scale (21 item version); *F*(df), test statistic of repeated measures ANOVA for the interaction of group*time; *M*, mean; MANSA, Manchester Short Assessment of quality of life; *p*, *p*-value; SD, standard deviation.

survey conducted among our clients in April/May 2020, many indicated that they appreciated the option of continuing their treatment through video-conferencing, and, although some considered it the second best option, they showed an understanding that there was no alternative due to the lockdown measures (de Beurs et al., 2021a).

Finally, it is important to note that treatments conducted (partially) during the COVID-19 pandemic were longer and involved more sessions. The increased number of sessions may be partially attributed to a reduction in no-shows, related to the use of video conferencing. Nonetheless, the fact that cohorts treated partially or predominantly with video conferencing had an extended treatment duration suggests that the possibility of inferior outcomes due to video conferencing cannot be entirely ruled out. It is possible that diminished treatment effects of video conferencing were offset by the longer treatment, Thus, further investigation is needed to determine the true efficiency of this treatment method.

Strengths

Strengths of the present study are the substantial number of participating patients, which yielded sufficient statistical power to appropriately test the non-inferiority hypothesis. Furthermore, the study used pre- and post-test data as part of the everyday routine in our

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addiction treatment center, as we applied routine outcome monitoring, assessing periodically progress during treatment (ROM; de Beurs et al., 2011). This amplifies the generalizability of the findings for everyday practice.

Limitations

The present study had an observational design: We used the COVID-19-related social distancing measures as a natural experiment to compare the effectiveness of video-conferencing and in-person treatment. The downside of this design is that it does not control for a possible (negative) impact of the COVID-19 pandemic itself on treatment outcomes and does not control for other differences in treatment between the cohorts, such as the duration, as was noted earlier. The effect of COVID-19 on alcohol consumption was mixed and heterogeneous in various countries (Kilian et al., 2021; Sohi et al., 2022). Nevertheless, a negative effect of COVID-19 on AUD treatment could be expected as the pandemic brought about social isolation and loneliness, an increase in stress (Van Der Feltz-Cornelis et al., 2020), and mental health problems (Wu et al., 2021). If an inferior effect of video conferencing treatment would have been found, we would not have been able to disentangle the treatment modality effect from a more general negative influence of the COVID-19 lockdown on general functioning, mental health, and AUD treatment response. On the other hand, treatment during COVID-19 could have been helped by the social distancing measures ordered by the government as these implied temporarily closure of bars and restaurants, thus offering less opportunities to use alcohol. However, alcohol consumption at home and related problems, such as domestic violence, increased during the pandemic (Callinan et al., 2021; Piquero et al., 2021), which may have been an impediment for effective AUD treatment. By and large, the effect of COVID measures on the effectiveness of AUD treatment remains unknown. Further research comparing video-conferencing and in-person treatment is therefore called for, with, preferably, more control over the experimental conditions.

The naturalistic design of the present study presented additional limitations. For a substantial number of patients, no post-test data were available and preliminary analyses revealed that there was some selective non-response at the post-test. Patients without post-test data appeared to be of higher age, were using more alcohol and had more severe psychopathology and lower general functioning. Thus, a cautionary note regarding the generalizability of the present findings for all AUD patients is in order. However, it should be noted that the generalizability of findings of previous research, comparing video conferencing treatment to in-person treatment by means of randomized controlled trials, is also limited, as participating professionals and patients must be at least willing to be randomized to the video conferencing modality of such a study.

Another limitation of the study is that alcohol use at post-test was assessed by the MATE interview conducted by the therapist. Patients may have underreported their alcohol use, which could have affected the treatment outcomes. However, there is no indication that this bias impacted one cohort more than the others, so the comparison between cohorts remains valid.

Video conferencing treatment is still viewed as an inferior treatment option to in-person by many professionals and patients (Békés et al., 2021). In our surveys among professionals and among clients, a majority indicated a preference for a return to in-person treatment or in-person blended with video conferencing when COVID-19 lockdown restrictions would be lifted (de Beurs et al., 2021a, 2021b), The majority of the respondents indicated that interpersonal contact and information transfer is leaner in video conferencing mode as nonverbal and implicit communication is limited. However, as communication through video conferencing is becoming increasingly common, in everyday life as well as between professionals and patients, from primary care delivery by general practitioners (Meurs et al., 2022) to sexual health care (Zimbile et al., 2022), hesitation to use video conferencing in mental health care may also subside, in which the COVID-19 crisis may play a pivotal role (Wind et al., 2020).

In a recent literature review, Cataldo et al. (2021) showed some divergence between professionals and patients regarding how video conferencing impacts the therapeutic relationship: professionals tend to highlight difficulties in establishing an effective therapeutic relationship, whereas patients are generally more satisfied with the relationship. Békés et al. (2021) mentioned that professionals differ in their ability to establish a strong therapeutic bond through video conferencing treatment, and also investigated professional self-doubt (in general and with this new technology). They concluded that both the view of the therapeutic relationship and professional self-doubt generate hesitance among professionals to use video conferencing. Also, in our previous study, attitudes toward video conferencing differed between professionals working in various mental health care settings within our institute. It appeared that professionals providing SUD treatment were more positive about video conferencing treatment, than professionals working with patients with personality disorders or with severe mental disorders (de Beurs et al., 2021b). Future research should investigate the influence of therapist factors such as age, having received training (Pierce et al., 2020) or (prior) experience with digital mental health care (Glueckauf et al., 2018), professional confidence, and therapeutic orientation (Probst et al., 2021) on openness to this treatment delivery mode.

Finally, as health care provision for AUC through video conferencing appears to have similar effects as achieved with traditional in-person treatment, it may also be a more cost-effective mode of treatment delivery. In fact, previous research (Smit et al., 2011) does suggest this is the case. In times of ever rising costs of health care provision, economic analysis of potentially efficient modes of treatment delivery is called for.

CONFLICT OF INTEREST STATEMENT

None to declare.

ORCID

Edwin de Beurs https://orcid.org/0000-0003-3832-8477

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