Behaviour Research and Therapy 135 (2020) 103735

Contents lists available at ScienceDirect

Behaviour Research and Therapy

journal homepage: www.elsevier.com/locate/brat

Large-group one-session treatment: Feasibility and efficacy in 138 individuals with phobic fear of flying

André Wannemueller*, Svenja Schaumburg, Sally Tavenrath, Alina Bellmann, Katharina Ebel, Tobias Teismann, Sören Friedrich, Jürgen Margraf

Mental Health Research and Treatment Center, Ruhr-Universität Bochum, Massenbergstraße 9-13, D-44787, Bochum, Germany

ARTICLE INFO

Keywords:
Exposure treatment
Group treatment
One-session treatment
Large-group one-session treatment
Fear of flying
Flying phobia

ABSTRACT

Recent research suggests that exposure-based large-group one-session treatments (LG-OSTs) may represent useful and efficient treatment options for different types of phobic fear. Although there are effective single session- and small group-interventions for the treatment of clinically relevant Fear of Flying (FoF), no LG-OST for this type of phobic fear has been realized so far. The present study aimed to investigate feasibility and efficacy of an LG-OST for the treatment of clinically relevant FoF. Two months after an initial diagnostics to assess FoF severity and confirm the underlying diagnoses (89% specific flight phobia; 10% agoraphobia), 138 patients attended the LG-OST consisting of psychoeducation, imparting of a breathing technique and a joint 2 ½ hour exposure flight in a chartered airplane (Airbus A320). FoF again was assessed at pre- and post-treatment as well as at 6-months follow-up with the latter again containing clinical diagnostics. Only a small decrease in FoF emerged in the pre-treatment interval. From pre-to post-treatment however, substantial reductions in FoF were observed with a large mean 'intention-to-treat' effect size of Cohen's $d = 1.42$ that remained stable over time (mean $d = 1.44$). At follow-up, 71% of the patients were rated as fully (55%) or partially remitted (16%). Also concerning the treatment of clinically relevant FoF, a LG-OST proved feasible and effective. Therefore, LG-OST can be regarded as a highly efficient and promising treatment tool which in terms of efficiency combines the advantages of one-session individual and group treatments.

Today, for most mental disorders highly effective cognitive behavioural treatment options exist (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). In the field of anxiety disorders including specific phobias, exposure-based interventions can be regarded as the gold-standard (e.g. Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008). However, access to these helpful treatment options is limited. In Germany for example, mean waiting time for a psychotherapy is about 20 weeks (BPtK, 2018) which bears the risk of avoidable symptom chronification and potentially may foster the use of more accessible but problematic treatment strategies such as psychotropic medication. In turn, this leads to longer treatment durations and prolonged waiting times for other patients. Furthermore, extended waiting periods may affect the motivation to seek psychological help particularly in individuals who are not sure if their symptoms are severe enough to justify professional treatment or who become accustomed with avoiding fear cues as a strategy to reduce anxiety, as is often the case in specific phobias (Wolitzky-Taylor et al., 2008). These issues emphasize the urge to develop highly efficient CBT-based interventions that are easily accessible. Disorders such as specific phobia for which clear-cut treatment recommendations already exist may be particularly suitable targets for this approach.

With a lifetime prevalence of 1.3%, flying phobia is relatively frequent though prevalence rates are smaller than those reported for other specific phobias (Wardenaar et al., 2017). However, prevalence rates of clinically relevant FoF may be even larger because severe FoF is often a feature of agoraphobia as well. However, agoraphobics avoid flying mainly because they fear having panic attacks while in flight, whereas individuals with a specific flight phobia avoid flying because they fear accidents and crashing (McNally & Louro, 1992). Although one might underestimate every-day impairment resulting from situational phobias, they are comparable to phobias of other types (Becker et al., 2007) and great subjective distress and significant functional impairment has been demonstrated, at least during the worst episodes (e.g., Essau, Conradt, & Petermann, 2000; Wittchen,

* Corresponding author. Ruhr-Universität Bochum, Dept. Clinical Psychology, Mental Health Research and Treatment Center, Massenbergstr. 9-13, D-44787, Bochum, Germany.

E-mail addresses: andre.wannemueller@rub.de (A. Wannemueller), svenja.schaumburg@rub.de (S. Schaumburg), sally.tavenrath@rub.de (S. Tavenrath), alina.bellmann@rub.de (A. Bellmann), katharina@ebel-jacobi.de (K. Ebel), tobias.teismann@rub.de (T. Teismann), soeren.friedrich@rub.de (S. Friedrich), juergen.margraf@rub.de (J. Margraf).

https://doi.org/10.1016/j.brat.2020.103735
Received 7 May 2020; Received in revised form 9 September 2020; Accepted 21 September 2020
Available online 24 September 2020
0005-7967/

Nelson, & Lachner, 1998). Furthermore, high comorbidity rates with other anxiety disorders or mood disorders can be observed (Depla, ten Have, van Balkom, & de Graaf, 2008). Although the proportion of individuals suffering from clinically relevant Fear of Flying (FoF) who seek professional help is relatively high in comparison to other specific phobias (Wardenaar et al., 2017), rates ranging between 28.4% (Wardenaar et al., 2017) and 41% (Depla et al., 2008) still demonstrate a need for improvement. Instead of making use of professional help offers, many phobic individuals apply rather dysfunctional treatment strategies in order to control their FoF such as anxiolytic drug taking and alcohol drinking in preparation of or during the flight (Wilhelm & Roth, 1997a; b).

As common for phobic disorders, exposure strategies are key components of successful psychological interventions targeting phobic FoF. So far, in most of the existing studies *in vivo* exposure was applied (Oakes & Bor, 2010), however, exposure conducted in virtual reality (VR) proved effective as well (Rothbaum et al., 2006). Commonly, exposure strategies are embedded in multi-session treatment programmes that also include providing information about fear and flight safety, relaxation training and cognitive techniques either delivered individually or in small group settings (see Oakes & Bor, 2010 and Schindler, Abt-Mörstedt, & Stieglitz, 2017 for reviews). Today, such small group trainings (between 8 and 15 patients) are often offered by commercial facilities located at airport facilities. Participants are treated for about two consecutive days with treatment components as summarized by Oakes and Bor (2010). However, effectivity evaluations of these programmes are often lacking or only refer to short-term outcomes (see Santos et al., 2011 for an example). Treating FoF in just one individual session has also been investigated and showed promising results with both *in vivo* exposure combined with cognitive restructuring (Öst, Brandberg, & Alm, 1997) and VR-exposure (Mühlberger, Wiedemann, & Pauli, 2003).

Seen from an efficiency perspective, combinations of one-session and group approaches have to be considered very useful. Such exposure-based one-session small-group treatments already exist and have first been introduced by the research group of Lars-Goran Öst for spider phobia (Götestam, 2002; Öst, 1996; Öst, Ferebee, & Furmark, 1997). Also concerning FoF there are two studies in which one-session treatments have been applied in groups with up to 8 patients (Van Gerwen, Spinhoven, Diekstra, & Van Dyck, 2002; Van Gerwen, Spinhoven, & Van Dyck, 2006). In one study the authors report comparable effects for a one-day BT and a two-day CBT and no differences between the groups concerning flying activity in a post-to follow-up interval (Van Gerwen et al., 2002). In the other study again the one-day programme yielded substantial effect sizes, however slightly better outcomes were reported for the longer two-day treatment (Van Gerwen et al., 2006).

To further improve the efficiency of interventions for phobic fears, Wannemueller et al. (2016; 2017; 2019) and Wannemueller, Fasbender, et al. (2018) developed large-group one-session treatments (LG-OSTs) where up to 79 individuals were treated at the same time. So far, existing LG-OST programmes targeted spider fear (see also a recent approach by Li, Newby, & Graham, 2020), dental fear, blood-injury-injection fear and height fear and led to substantial reductions of subjective and behavioural fear responses immediately after treatment and in the short-term (4–8 months) follow up, in particular when applying extensive *in vivo* exposure strategies. Based on the positive findings on LG-OSTs in situational fears as well as one-session and small-group interventions in phobic FoF, the present study aimed to investigate whether an exposure-based LG-OST proves feasible and effective for the treatment of clinically relevant FoF. Encouraged by the previous results, we hypothesise, that the LG-OST would lead to significant and time-stable reductions in subjective and behavioural FoF.

1. Materials and methods

1.1. Patients

Recruiting of the patients took place via a local radio campaign, advertisements in newspapers and a report on a local television station. Additionally, a website was established for the project containing information about prior LG-OST trials, the study team and procedures. Patients could register via e-mail and then were allocated to the psychotherapeutic consultation that preceded the treatment.

There were two inclusion criteria for participating in this LG-OST feasibility trial. Being of legal age and FoF serious enough to warrant the diagnosis of a phobic disorder, i.e., specific phobia (*300.29*) or agoraphobia with (*300.21*) or without a history of a panic disorder (*300.22*) according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013). Exclusion criteria comprised the presence of manic or hypomanic episodes, schizophrenic diseases and severe post-traumatic stress disorder. Furthermore, the presence of the following somatic criteria led to exclusion from the study: pregnancy, severe infectious diseases, acute middle ear infection, cardiopulmonary diseases, epilepsy, previous strokes, and severe physical or mental disability. Altogether, 625 persons registered by e-mail from whom the first 203 were invited to attend the initial diagnostic session. Of the 170 people who attended initial diagnostics, 16 had to be excluded due to the above mentioned criteria. Finally, $n = 138$ individuals attended the one-session treatment, see Fig. 1.

Patients gave informed consent to attend the LG-OST and having their data used for research purposes at the initial diagnostic session. The local Ethics Committee of the Faculty of Psychology of the Ruhr-Universität Bochum approved the study (ethical approval number 428).

2. Procedure

2.1. Initial diagnostics

Initial diagnostics took place at the Mental Health Research and Treatment Center (MHRTC) in Bochum, on average two months ($M = 2.06$, $SD = 1.19$) prior to LG-OST. It was conducted in individual sessions either by a licensed psychotherapist or a post-graduate clinical psychologist. Diagnostics started with an assessment of the defined inclusion and exclusion criteria related to mental health by the use of a semi-structured clinical interview (Short Interview for Mental Disorders, Mini-DIPS-OA; Margraf & Cwik, 2017). Although no information regarding psychometric properties of this interview are available to date, a very good inter-rater reliability for anxiety disorders with $\kappa = 0.94$ has been reported for the predecessor version (Margraf, Cwik, Pflug, & Schneider, 2017). Subsequently, a member of the research team provided detailed information on the treatment procedure and the objectives of the research project. Afterwards he or she processed a check list with the respective patient in order to ensure absence of the defined physical exclusion criteria. Moreover, at this stage, patients completed FoF related questionnaires, i.e., the DES, AES, FFB, FSB, see the measurement section for a description.

2.2. Large-group one-session treatment

The LG-OST was conducted at the International Airport of Münster-Osnabrück in Germany on February 17th' 2019. It was guided by a well-trained postgraduate clinical psychologist and licensed psychotherapist experienced in conducting LG-OSTs. It lasted for about 5 h and consisted of four phases: a psychoeducation phase, a training phase, an exposure phase consisting of a flight over Germany, and a debriefing phase. The exposure flight was accompanied by 26 psychological professionals, three medical doctors, and six members of the project team. While the team members were supposed to assist the professionals when necessary, e.g. when help was needed to calm a patient, the doctors were on board in order to use drugs to sedate a patient in an emergency, e.g. if he or she showed very aggressive or uncontrolled behaviour that endangered the safe continuation of the flight. The presence of doctors was also made mandatory by the operating airline.

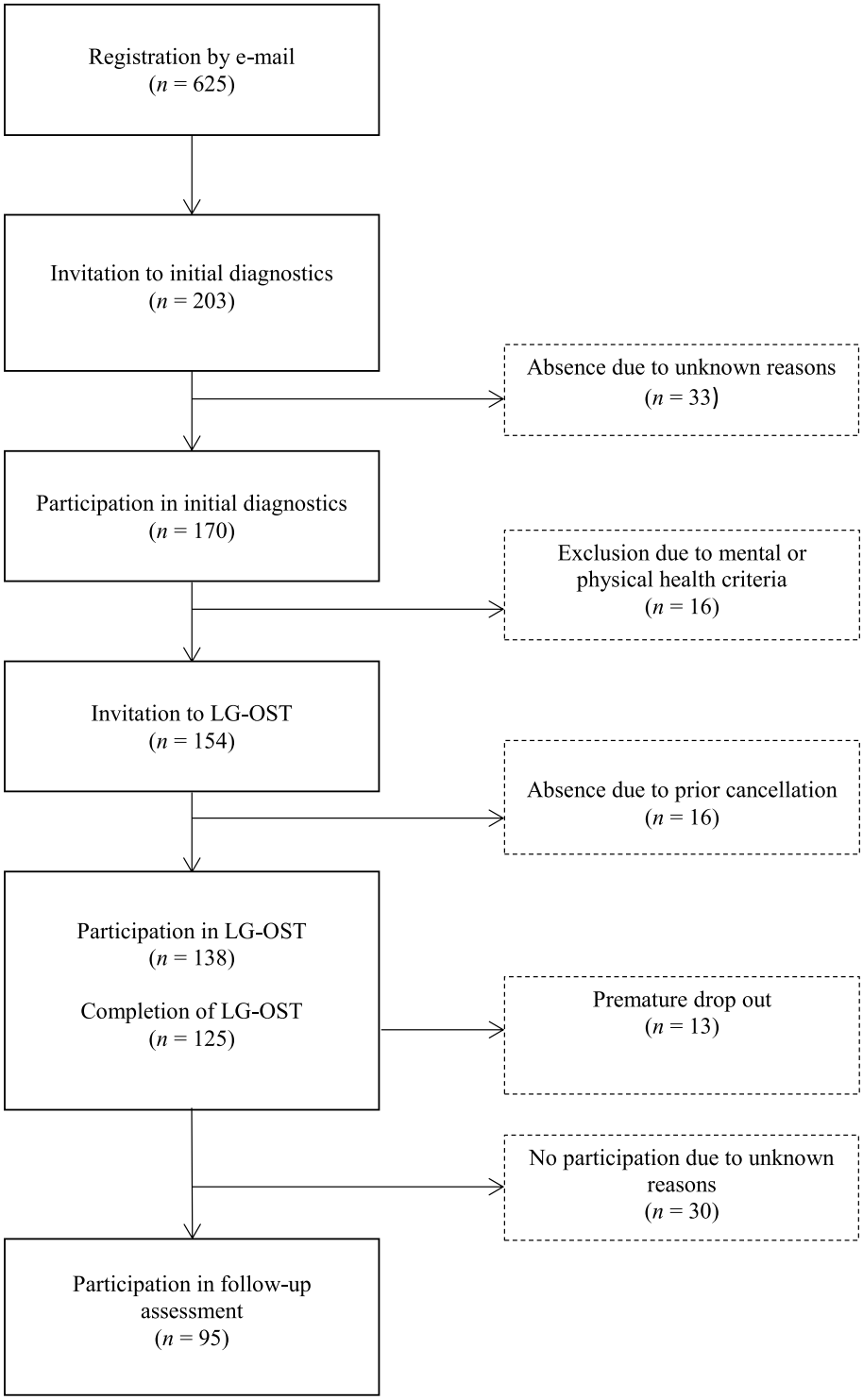

Fig. 1. Flow diagram of patients entering the study.

Before the actual treatment started there was a pre-treatment assessment where the participants were asked to complete the same questionnaires concerning their subjective FoF and symptom distress as at the initial diagnostics (see the measures section for more details concerning the applied questionnaires).

2.2.1. Psychoeducation phase

In order to realize the first LG-OST phase, the psychoeducation phase, patients were gathered in a conference hall at the airport. Immediately before it started, they were asked to fill in the same questionnaires as in the initial diagnostic phase (pre-treatment assessment). During the psychoeducation phase, they received some information on the nature and utility of fear, based on the three-level approach (Lang, 1979). Afterwards, the psychotherapist explained possible pathogenic factors and mechanisms involved in the development of phobic FoF and how it is maintained over time. It was explained to the patients that one possibility to achieve a reduction of phobic fear symptoms would consist in changing fear-evoking expectancies through gathering new corrective experiences during the exposure flight. They were invited to write down catastrophic

expectancies concerning technical/situational flight aspects (e.g. “we're going to hit heavy turbulence and the wings of the airplane will break”; “we will run out of fuel”), their bodily fear responses (e.g. “I'll get a full-blown panic attack”) and behavioural aspects, i.e., what they would never be able to do during the flight (“I would never dare to get out of my seat and walk down the aisle”). The psychotherapist motivated the patients to challenge their beliefs and expectancies during the upcoming exposure flight. The second part of the psychoeducation phase rather concerned technical flight aspects and was provided by an interview with the flight captain and crew members who answered some frequently asked questions about flying such as how frequently technical problems with catastrophic outcomes occur, how security checks and safety procedures are conducted and how the captains handle bad weather conditions in case of occurrence. In addition to the questions prepared by the research team, patients also had the possibility to ask their own questions.

2.2.2. Training phase

In the training phase patients practiced a diaphragmatic breathing technique consisting of deep, calm exhalation guided by the therapist (for a more detailed description see Wannemueller et al., 2017). After the exercise was done, he explicitly pointed out however, that the breathing strategy was not necessarily needed to withstand the exposure treatment but that the application can be helpful in order to dampen quite violent fear peaks and may be useful to challenge the expectancy of not having control over strong (bodily) fear responses. He further explained, that even very strong bodily fear symptoms are harmless for the organism and even appropriate in case of a threat. The use of the breathing technique should also take account to the fact that in a group context with a therapist-patient ratio of 1:5 as envisaged for the exposure flight the therapists could not look after the patients to the same extent as an individual setting would allow. Therefore, in the local LG-OST context we aimed to provide our patients with more self-help strategies than we would have done within an individual treatment-setting where the support of a psychologist normally is available quite immediately. Moreover, in a VR-based exposure treatment targeting phobic FoF the application of diaphragmatic breathing techniques was associated with positive treatment outcomes and a higher tendency to effectively overcome FoF in the patients. (Shiban et al., 2017).

2.2.3. Exposure phase

Exposure consisted of a two-and-a-half-hour flight over Germany with an airplane (Airbus A320, 168 passenger seats) chartered for this project. After passing a usual airport security control procedure, patients were invited to board the aircraft. When the last participant had entered the aircraft, a psychotherapist asked through the onboard audio system if anybody wanted to get off the plane as the doors would now be closed. At this point, patients could finally decide whether they want to take part in the flight or stay on the ground. For patients who decided not to take part in the flight, a video exposure was provided consisting of the presentation of air travel videos. Movies contained scenes of an aircraft taking off and landing as well as cabin scenes during a flight. During video exposure a psychologist was continuously available to the patients. All patients who did not take part in the exposure flight were offered individual treatment in the MHRTC.

Throughout the flight, one psychological professional was located in every seat row and motivated the patients to self-expose to upcoming bodily and cognitive fear responses and not to engage in safety behaviour or distraction. In addition, he or she explained to the patients that they could use the breathing strategies at any time during the flight, but only explicitly asked them to do so when there were visible signs of a panic attack such as shortness of breath. Furthermore, the psychologists encouraged the patients to challenge their fear evoking expectancies whenever possible, e.g. by testing behaviours previously estimated as being impossible, such as unbuckling and standing up during the flight or walking through the aisle. In order to meet the individual needs of the patients in the best possible way, patients could provide their therapists with their negative expectancies by handing them out the sheet on which they had previously written down their expectancies. This allowed the therapists to give the patients individual advice on what they could do and try out during the flight in order to best challenge their fear-inducing expectancies.

During the whole flight, the flight captain explained all processes and procedures in detail, e.g. the reason for a specific noise, via the board microphone. Moreover, he performed some maneuvers, i.e., reducing the flying altitude, lowering the landing gear, or extending the flaps in order to show the patients what these procedures sound like and how the airplane reacts to them. Moreover, the cabin crew was always available for the patients in case of further questions.

2.2.4. Debriefing phase

After the exposure flight and a 1-h lunch break patients were gathered again in the conference hall where they first were invited to share their personal experiences with the other patients. Moreover, in order to enhance a violation of expectancy effect, patients were asked to rate for each of their previously recorded expectancies the extent by which they had come true. Furthermore, the therapist provided some information regarding relapse prevention such as the importance of additional flights in order to strengthen their confidence and self-efficacy, and in turn avoid a return of fear. He red-flagged possible signs of relapse such as re-emerging avoidance tendencies. Following the debriefing phase and prior leaving, patients again were asked to provide information concerning FoF and symptom distress (post-treatment assessment) using the same set of questionnaires as presented at pre-treatment assessment.

2.3. Follow-up assessment

All patients could voluntarily sign-up for FU-assessments. Ninety-five patients (76% of the patients completing the LG-OST) attended the FU-investigation that again took place at the MHRTC in Bochum on average 6.35 (SD = 0.48) months after the LG-OST. It was individually conducted by a postgraduate psychologist who was blinded concerning the post-treatment LG-OST outcome of the respective patient. Follow-up assessment included the same diagnostic interview (Mini-DIPS-OA) and set of questionnaires that were also used at initial diagnostics and the pre- and post-treatment assessments respectively. Furthermore, patients were asked about their flying behaviour i.e., if and how often they took a flight in the post-treatment to follow-up interval and could state the reason if they did not take any further flight. Patients were classified as ‘fully remitted’ by the psychologist when the initial diagnosis underlying FoF was no longer valid, i.e., when symptoms were completely absent or if they still existed but were only present on a subclinical level. Patients were classified as ‘partially remitted’ when they stated they would take a flight (or even did within the post-treatment to follow-up interval) but that at least moderate fear symptoms would still exist or ‘not remitted’ when the initial diagnosis still consisted. Moreover, patients could indicate if their fear evoking expectancies had further changed in the pre-treatment to FU interval.

3. Measures

3.1. Fear of flying

Subjective FoF was assessed using the German ‘Flugangst- und Flugphobie-Inventar’ (FAPI, Mühlberger & Pauli, 2011, engl. Fear of Flying and Flying Phobia Inventory). The FAPI consists of the German ‘Flugangst-Fragebogen’ (FFB, engl. Fear of Flying Questionnaire) and the ‘Flugphobie-Screeningbogen’ (FSB, engl. Flying Phobia Screening Instrument). The FFB is the German version of the Fear of Flying Scale (FFS; Haug et al., 1987) consisting of 21 items with 5-point Likert scales (0 = no fear; 4 = very strong fear). The instrument provides a

dimensional assessment of FoF severity, covering five subscales (generalized fear of flying, anticipation, flying, turbulence, landing). The FFB can be applied for treatment planning as well as for measuring treatment progress. It has a good internal consistency, Cronbach's $\alpha = 0.90$, and a retest reliability of rtt = 0.83 (Mühlberger, Herrmann, Wiedemann, Ellgring, & Pauli, 2001). In our sample, internal consistency of the FFB was excellent with Cronbach's $\alpha = 0.92$. The FSB consists of seven dichotomous items (yes/no) conceiving the relevant DSM-IV criteria for FoF. Furthermore, the individual flying experiences as well as possible reasons for developing FoF are captured.

Moreover, subjectively perceived FoF was assessed on a one-item 11-point Likert scale (0 = no fear at all, 10 = extreme fear). Patients were asked to imagine sitting in a plane that was about to taxi on the runway indicating how anxious they felt: '*Imagine you're on a plane that's about to roll onto the runway. How fearful are you?*'

The German version of the Anxiety Expectancy Scale (AES, Mühlberger, 2003a, engl. Version Gursky & Reiss, 1987) was used to assess the expectation of perceiving anxiety symptoms during the flight. The questionnaire consists of ten items with 5-point Likert scales (1 = not at all; 5 = for certain) describing different symptoms or negative feelings that might occur during a flight. The authors of the German version of the AES report a good internal consistency, Cronbach's $\alpha = 0.81$, and a retest reliability of $r_{tt} = 0.75$. In our sample, internal consistency was acceptable with Cronbach's $\alpha = 0.79$.

In order to assess the subjective expectancy for the occurrence of a dangerous event during flight, the German version of the Danger Expectancy Scale (DES, Mühlberger, 2003b, engl. Version Gursky & Reiss, 1987) was used. With nine items rated on a 5-point Likert scale (1 = very rare; 5 = very often), it is estimated how likely certain thoughts would occur during a flight. The DES has a good internal consistency, Cronbach's $\alpha = 0.86$, and a retest reliability of rtt = 0.67. In our sample, we found an excellent internal consistency of Cronbach's $\alpha = 0.90$.

3.2. Symptom distress

The German Version of the STAI (Laux, Glanzmann, Schaffner, & Spielberger, 1981 engl. Version Spielberger, Gorsuch, & Lushene, 1970) was used to assess state and trait fear levels. It includes two subscales with 20 items each. Every item constitutes a statement about an emotional state experienced currently (state subscale) or in the last two weeks (trait subscale) and can be rated on a 4-point Likert scale (1 = not at all; 4 = very much). Scores range from 20 (no anxiety) to 80 (high anxiety). In our sample, the internal consistency was excellent with Cronbach's $\alpha = 0.93$ for the trait-scale and $\alpha = 0.95$ for the state-scale.

The German version of the Depression Anxiety Stress Scale (DASS-21, Nilges & Essau, 2015, engl. Version Lovibond & Lovibond, 1995) was used to measure three negative emotional states: depression, anxiety and stress. For each subscale, 7 items have to be rated on a 4-point scale (0 = never; 3 = almost always). The authors report good to excellent internal consistencies of $\alpha = 0.91$, $\alpha = 0.81$, and $\alpha = 0.89$ for the depression, anxiety and stress scale, respectively. Internal consistencies in our sample can be rated as good with $\alpha = 0.87$ for the depression scale, $\alpha = 0.80$ for the anxiety scale and $\alpha = 0.88$ for the stress scale.

3.3. Subjective rating of therapy success

We assessed subjective treatment success using the Global Success Rating (GSR). The question "in comparison to the beginning of the treatment I feel …" has to be answered on a 7-item Likert scale ranging from 1 = much worse to 7 = much better.

3.4. Statistical analysis

Time x measure repeated measures (rm)MANOVA containing the DES, AES, FFB, and FSB were used in order to analyse the course of FoF at different times of measurement. The one-item measure was not included, as it was not provided at initial diagnostics. In addition, the results of single rmANOVAs conducted for each measure separately are reported. Moreover, in order to create a compound measure of FoF mainly for illustrations, we z-standardized the scores of these instruments across each individual and time point. Effect sizes were calculated using Cohen's *d* formula based on pre-treatment standard deviations (Cohen, 1988). Post-treatment results that did not include the follow-up data were carried out as 'intention-to-treat' results, i.e., in case a patient had prematurely dropped out from LG-OST no change was assumed and missing post-treatment scores were imputed with the respective pre-treatment scores. The statistical data was analysed using the statistics programme IBM SPSS Statistics version 24.0.

4. Results

4.1. Sample description

Mean age of the 138 individuals who attended the treatment was 48.5 years ($SD = 13.1$) with 104 (75.4%) being female and 34 (25.6%) male. In 89% of the cases a specific phobia was the diagnosis underlying the FoF, an agoraphobia without history of panic disorder was diagnosed in 10.1% of the cases (in one participant information concerning diagnosis was missing). Only in 19.6% of the patients ($n = 27$) a comorbid disorder was diagnosed (of which the majority were specific phobias and agoraphobia either with or without history of panic disorder), see Table 1.

4.2. Are FoF levels time-stable in the pre-treatment interval?

rmMANOVA shows a significant effect of time $F(3,384) = 15.89$, $p < .001$ indicating a decrease in FoF from initial diagnostics to pre-treatment assessment. Moreover there was a time x measure effect, $F(3, 384) = 8.89$, $p < .001$ demonstrating a comparably large decrease in the DES, $F(1, 137) = 6.84$, $p = .01$, and FFB, $F(1, 137) = 17.61$, $p < .001$, compared to only small changes in the AES, $F(1, 137) = 4.18$, $p = .043$ and stable scores in the FSB, $F(1, 128) = 0.67$, $p = .42$.

4.3. Is LG-OST effective in reducing FoF at post-treatment assessment?

Of the 138 patients who participated in the LG-OST programme, 125 (90.6% of total) completed the LG-OST procedure and thirteen (9.4%) left LG-OST prematurely. 'Completion' was defined as taking part in the post-treatment assessment regardless of whether a patient had taken part in the flight (which did 118 of the treatment completers) or the alternative video exposure session (which did 7 of the completers). Altogether, 120 patients completed the exposure flight, of which two prematurely left the LG-OST. All other patients who left LG-OST prematurely refused to take part in the exposure flight. The post-treatment questionnaires concerning FoF of one patient who took part in the flight could not be evaluated due to missing questionnaire processing.

Averaged across all FoF measures, the LG-OST led to an 'intention-to-treat' (ITT) post-treatment fear reduction of 33.9%, which indicates a large pre-to post-treatment effect, $F(5, 127) = 67.45$, $p < .001$. Mean effect size (Cohen's *d*) averaged across all measures assessing FoF was $d = 1.42$, see Fig. 1 for a course of FoF. Post-treatment ITT fear reduction of patients who attended the flight was 37.2%. In non-attenders ITT fear reduction only was 10.6% which indicates a highly significant difference $F(1, 134) = 24.99$, $p < .001$. However, in patients who did

Table 1
Means, SDs and effect strengths (Cohen's *d*) of pre-post changes of FoF measures (intention-to-treat) in patients who attended the LG-OST (n = 138).

	n	initial diagnostics	pre treatment	post treatment	statistics (pre- vs. post treatment)		effect size
		M (SD)	*M (SD)*	*M (SD)*	*F*	*p*	*Cohen's d [95% CI]*
Sociodemographic and distress measures							
Age (years)	138	–	48.22 (13.03)	–	–	–	–
Acad. education (years)	106	–	11.63 (6.40)	–	–	–	–
STAI-S	136	–	51.48 (12.19)	31.55 (11.86)	276.19	< .001	1.41 [1.14–1.67]
STAI-T	138	–	40.31 (12.12)	–	–	–	–
DASS-21 total	136	–	12.18 (9.43)	–	–	–	–
depression	136	–	2.40 (3.23)	–	–	–	–
anxiety	136	–	2.93 (3.30)	–	–	–	–
stress	136	–	6.85 (4.70)	–	–	–	–
Fear of flying measures							
AES	136	36.10 (6.60)	35.16 (6.91)	25.69 (9.13)	212.87	< .001	1.50 [1.24–1.77]
DES	136	26.54 (9.17)	25.00 (8.90)	16.23 (6.69)	158.97	< .001	0.98 [0.73–1.23]
FFB	134	54.69 (11.20)[a]	51.02 (12.44)	29.94 (16.92)	241.76	< .001	1.63 [1.36–1.91]
FSB	137	5.32 (0.94)[a]	5.23 (1.11)	3.77 (1.90)	92.82	< .001	1.19 [0.94–1.45]
Single item measure	133	–	8.11 (1.96)	4.35 (2.87)	256.24	< .001	1.78 [1.50–2.06]
Avoidance (months)	116	80.51 (115.05)	–	–	–	–	–
Global Success Rating	118	–	–	6.15 (0.76)	–	–	–

Note. STAI, State-Trait Anxiety Inventory; DASS-21, Depression Anxiety Stress Scale; AES, Anxiety Expectancy Scale; DES, Danger Expectancy Scale; FFB, Fear of Flying Questionnaire; FSB, Flying Phobia Screening Instrument. *n* can slightly differ between measures due to incorrectly completed questionnaires; [a]contains initial diagnostics data of 129 patients due to missing questionnaire data.

not attend the flight but instead participated in the video exposure and completed the whole treatment day ($n = 7$) flight fear reduction was 25.7% which did not significantly differ from the 37.8% fear reduction observed in treatment completers who attended the flight ($n = 117$).

Table 1 displays means, standard deviations, separate rmANOVA results, and effect sizes of pre- to post changes for each of the applied questionnaires.

4.4. Are the LG-OST effects stable over time?

Ninety-five LG-OST-patients (76% of the patients completing the LG-OST) were available for follow-up assessments of which 93 (97.9%) had taken part in the flight exposure and 2 (2.1%) in the video exposure. The mean time interval between post- and FU-assessment was 6.35 months ($SD = 0.48$). A comparison between patients available for FU assessment and those who were not showed no difference regarding age, gender, years of academic education, pre-treatment state fear (STAI-State) and distress levels (STAI-Trait; DASS-21) with all *p*'s > 0.16. Furthermore, follow-up returners did not differ from non-returners regarding pre-treatment FoF levels in the DES, FFB and the Single Item Measure nor regarding the pre-to post-treatment fear reduction in any of the questionnaires used (all *p*'s < .05). The only differences emerged in case of the AES, $t(124) = -2.89$, $p = .01$, and the FSB, $t(124) = -2.09$, $p = .04$ with follow-up completers displaying lower pre-treatment scores.

rmMANOVA containing the post-treatment and follow-up measurement occasions yielded neither a significant effect of time, $F(1, 264) = 0.77$, $p = .38$ nor a time x measurement effect $F(3, 264) = 2.68$, $p = .08$, which indicates stability of fear levels within the post-treatment to follow-up interval, see also Fig. 2. Table 2 displays means, standard deviations, separate rmANOVA results, and effect sizes of pre- to follow-up and post- to follow-up changes for each of the applied questionnaires.

The mean fear reduction averaged across all questionnaires compared to pre-treatment fear was 36.01%. All effect sizes representing pre-treatment to FU changes can be considered large with reference to the interpretation according to Cohen (1988). Besides large changes in FoF measures, significant effects on symptom distress (DASS-21 and the STAI-Trait) were also observed with small to moderate effect sizes ranging from $d = 0.40$ for the STAI-Trait to $d = 0.55$ for the DASS-21 total score.

In the post-treatment to follow-up interval, 62.1% of patients took at least one flight ($M = 1.86$, $SD = 1.81$) and 89.2% of the patients who did not fly after the treatment stated this has been caused by other reasons than FoF, e.g. time constraints or financial issues. Additional analyses were conducted for the patients who flew again after the treatment for at least one time. The mean anxiety experienced during the flights after the treatment was 3.66 ($SD = 2.33$) on a scale ranging from 1 (no anxiety) to 10 (extreme anxiety). Prior participating in LG-OST, patients avoided flying on average for more than six and a half years ($M = 80.51$; $SD = 115.05$ months).

At follow-up assessment, 80 patients were also available for a second diagnostic interview. Of these patients 55% ($n = 44$) were classified as completely remitted, 16.3% ($n = 13$) as partly remitted and 28.8% ($n = 23$) as not remitted. Remitters did neither differ from non-remitters concerning their pre-treatment FoF-levels (all *p*'s > 0.059) nor FoF-levels assessed at initial diagnostics two months before the LG-OST (all *p*'s > 0.149). The same was true for the pre-treatment depression, anxiety and stress-levels (DASS-21). Also concerning pre-treatment state-fear levels (STAI-State) the difference between the two groups was on a non-significant level, $p = .059$.

5. Discussion

We hypothesised that an exposure based large-group one-session fear treatment would be feasible and effective in reducing clinically relevant FoF in people meeting the criteria for specific phobia or agoraphobia. With this trial, we aimed to extend the previous promising results from LG-OST trials for different phobic fears (e.g. Wannemueller et al., 2019) to FoF.

The present intervention clearly shows that treating a group of 138 individuals with phobic FoF in a one-session treatment trial at the same time is feasible. Data demonstrate that about 90% of the patients completed LG-OST as intended. Consequently, the vast majority received the dose and content of treatment as intended. Many patients showed heavy fear responses during the whole LG-OST procedure. However, even during very tense situations, for example when the airplane was about to take off, the atmosphere was predominantly positive and supportive and many of the patients encouraged each other to overcome their avoidance tendencies and upcoming fears. Nevertheless, it must be pointed out that with a treatment programme of this magnitude, it is essential to ensure that sufficient psychological

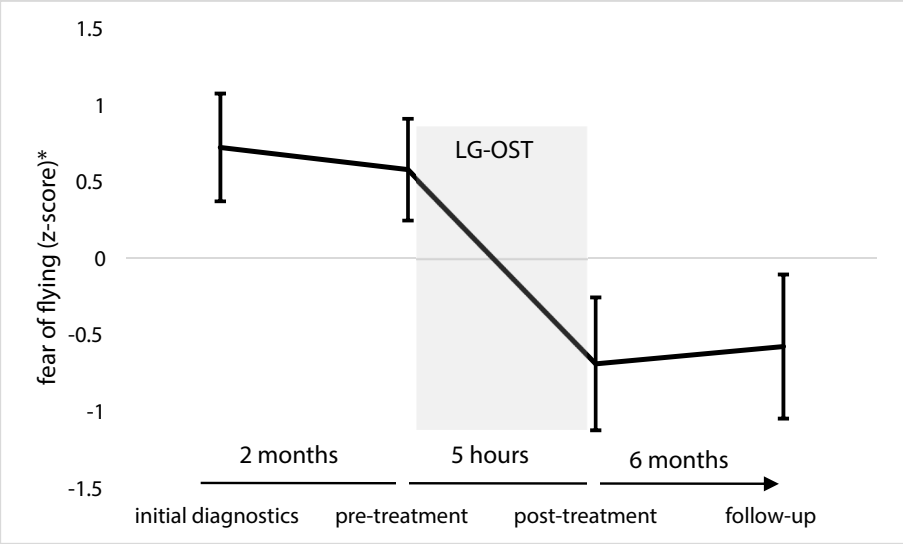

Fig. 2. Course of FoF-levels in $n = 95$ patients who returned to follow-up assessment.
Note. error bars show standard deviations; * fear of flying was calculated as mean standardised score averaged across the AES, DES, FFB and FSB.

care is provided for the patients, especially at moments, which have proven to be particularly critical in terms of the emergence of severe fear reactions, such as the boarding process, taxiing over the runway and departure. Because we aimed to realise the most realistic flight experience (and due to the airport and flight restrictions) patients had to undergo a normal security check prior to boarding. Unavoidably, this was a quite lengthy procedure (considering the large number of patients). Consequently, those who passed the security check first had to sit and wait in the plane until the last participants had passed the checkpoint. In addition, some patients, who were still hesitant about overcoming their avoidance, still stood at the gate and talked to a psychologist available for this purpose. These delays increased anticipatory anxiety unnecessarily of those who had already decided to fly. However, the psychologist could hardly convince anyone of the hesitant ones in this situation. Based on these facts, future treatment sessions should invest less in this persuasion work resulting in a faster boarding process. In contrast to smaller group programmes for FoF (see Van Gerwen, Diekstra, Arondeus, & Wolfger, 2004) where exposure flights normally are conducted within regularly scheduled flights, the LG-OST exposure flight was a non-regularly flight exclusively chartered for the patients and staff. This has the advantage of providing greater support and technical information from the flight crew and captain which many of the patients stated in the debriefing phase being very helpful.

In contrast to the flight exposure which was rated very positively by the vast majority, the video exposure was not so well received by the patients. It was planned as an alternative programme for patients who were not capable or refused to take part in the flight. However, most of these individuals were either highly frustrated because they had failed to overcome their avoidance behaviour and/or still very aroused and agitated. Although team members who were to accompany the video exposure tried supporting and stabilizing them, some of these patients prematurely left the LG-OST and did not take part in the video exposure. They were offered individual treatment which two of them also took advantage of later. Due to this experience, future LG-OST trials

Table 2
Means, SDs and effect strengths (Cohen's d) of pre-follow changes and post-follow-up changes in patients who attended follow-up assessment (n = 95).

	n	initial diagnostics	pre treatment	post treatment	follow-up	statistics (pre vs. follow-up)			statistics (post vs. follow-up)		
		M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*F*	*p*	*Cohen's d*	*F*	p	*Cohen's d*
Distress measures											
STAI-S	94	–	50.70 (11.93)	28.58 (6.31)	32.66 (8.25)	208.30	< .001	1.29 [0.97–1.60]	22.28	< .001	−0.57 [-0.86 – (−0.28)]
STAI-T	94	–	40.03 (12.90)	–	35.56 (9.73)	17.93	< .001	0.40 [0.11–0.69]	–	–	–
DASS-21 total	94	–	13.09 (9.69)	–	8.55 (7.30)	33.52	< .001	0.55 [0.26–0.84]	–	–	–
depression	94	–	2.69 (3.40)	–	1.47 (2.19)	20.18	< .001	0.42 [0.13–0.71]	–	–	–
anxiety	94	–	3.16 (3.46)	–	1.74 (2.36)	23.185	< .001	0.45 [0.16–0.74]	–	–	–
stress	94	–	7.25 (4.82)	–	5.34 (4.25)	19.07	< .001	0.43 [0.14–0.72]	–	–	–
Fear of flying measures											
AES	90	35.65 (6.69)	34.09 (7.08)	24.53 (8.93)	25.70 (9.28)	127.55	< .001	1.44 [1.11–1.76]	2.48	.12	-[a]
DES	90	26.94 (9.11)	25.41 (9.20)	15.62 (6.32)	17.80 (7.15)	85.71	< .001	0.89 [0.59–1.20]	11.58	.001	−0.39 [0.09–0.68]
FFB	91	53.64 (11.61)[b]	50.60 (12.75)	27.74 (16.29)	27.53 (17.09)	181.91	< .001	1.70 [1.36–2.03]	0.02	.90	-[a]
FSB	90	5.16 (0.97)[b]	5.06 (1.18)	3.62 (1.70)	3.16 (2.06)	86.38	< .001	1.41 [1.09–1.74]	4.92	.03	0.26 [0.04–0.55]
Single item measure	92	–	7.97 (2.00)	4.07 (2.54)	4.22 (2.82)	190.30	< .001	1.77 [1.43–2.11]	0.31	.58	-[a]
Avoidance (months)	78	80.71 (124.73)	–	–	–	–	–	–	–	–	–
Global Success Rating	92	–	–	6.19 (0.77)	5.67 (1.00)	–	–	–	18.92	< .001	−0.53 [-0.82 – (−0.24)]

Note. STAI, State-Trait Anxiety Questionnaire; DASS-21, Depression Anxiety Stress Scale; AES, Anxiety Expectancy Scale; DES, Danger Expectancy Scale; FFB, Fear of Flying Questionnaire; FSB, Flying Phobia Screening Instrument; *n* can slightly differ between measures due to incorrectly completed questionnaires. [a] Cohen's *d* not reported due to non-significant change; [b] contains data of 86 patients due to missing questionnaire data.

should think very carefully about how they can accommodate patients who were unable to participate in the flight and ensure as far as possible that they can continue the programme.

Concerning LG-OST effectivity, we observed a substantial decrease in subjectively reported FoF that was maintained in follow-up returners. This finding is supported by follow-up interview diagnostics yielding remission or partial remission in more than two thirds of the patients with more than half of participants no longer meeting criteria for their primary phobia diagnosis. The large mean 'intention-to-treat' effect size of $d = 1.42$ at post-treatment fully lies in the range of those reported for already existing small-group programmes. For example, with varying *d*'s between 0.57 and 1.41 the post-treatment effect sizes reported by Santos et al. (2011) were somewhat smaller, whereas the follow-up effect sizes ranging from 1.38 to 2.38 for a one-day small group training reported by Van Gerwen et al., 2006 slightly surpass the LG-OST effects. Compared to LG-OSTs conducted in other situational fears, the here observed effects were larger than any previously reported. There can be several reasons for this. First, in contrast to the other LG-OSTs this trial has been conducted in diagnosed patients. It is therefore possible that the patients may have had particularly strong phobic fears and in turn may have benefited particularly strongly from the treatment. However, to the view of the authors it is more likely that the reason for this is that the exposure flight was the longest and most intense exposure element ever applied in LG-OSTs.

Despite the fact that no control group was included in this A-B-A designed single-case-series, our data clearly demonstrates that the huge change in FoF severity we observed between the pre-treatment and post-treatment assessment was due to treatment and not caused by regression towards the mean or repeated measurement effects that often have been suggested to compromise the validity of existing LG-OST findings. Although FoF levels already started to decrease in the time interval between initial diagnostics and pre-treatment assessment, the decrease observed in the few hours between pre- and post-treatment assessment was larger by at least a factor of six (FFB) and maintained in the 6-months follow-up interval. The fact that FoF slightly decreased in the pre-treatment interval is interesting and quite contra-intuitive to the authors' suggestions and one might only speculate for possible reasons. It could well be that the certainty of receiving treatment for FoF has already led to relief for patients. On the other hand, patients may have indicated particularly high FoF levels during the initial diagnostic session having thought that this would increase their chances of participating.

The results also suggest LG-OST effectiveness on a behavioural level. It has been criticised previously that behavioural measures such as flying activity are biased by other mediating factors such as the opportunity to fly, and are often not related to flying activities before treatment (Oakes & Bor, 2010). The present study reveals that the intervention successfully reduces avoidance behaviour in that 62% of follow-up returners flew in the follow-up interval. Patients who stated they had avoided flying for more than six and a half years (about 80 months) prior to LG-OST reported to have flown on average about two times in the six months following the treatment. Moreover, the majority of patients who stated they had not flown in the post-treatment to follow-up interval stated reasons other than FoF being responsible for this such as financial or timely issues.

Besides its clinical usefulness, LG-OSTs may represent promising research tools due to their high standardisation. In view of still unsatisfactory response and relapse rates following psychological treatment, it is needed to identify moderators and mediators of treatment outcome as well as underlying mechanisms in order to improve the offers. However, studies in search for these factors often apply heterogeneous treatments that vary in content, dose, and form of delivery which hamper clear conclusions. Using LG-OSTs allows to treat patients in a time efficient manner and ensure highly standardised treatment delivery. Therefore, it may represent a useful research tool, see Wannemüller, Moser, Kumsta, Jöhren, & Margraf, 2018; Wannemueller, Moser, et al., 2018; Wannemueller et al., 2019 for recent moderator analyses on the basis of LG-OSTs.

Some limitations to our study need to be mentioned. First, although results clearly suggest that pre- to post-changes in FoF were due to treatment, future studies are needed that include an untreated, placebo-treatment or active control group in order to investigate LG-OST's comparative effectivity and to dismantle the effects of different treatment components applied in the LG-OST programme. Second, although many patients reported at follow-up assessment that they had made a commercial flight after the treatment, the lack of a behavioural approach test does not allow for an exact assessment of treatment effects at a behavioural level. Third, as the diagnostic classification for each patient was solely carried out by one psychologist both before the treatment and at follow-up no information on the inter-rater reliability of the diagnostic assessments is available. However, if structured clinical interviews are used as was the case here, the reliability of diagnoses concerning anxiety disorders can be considered to be high (Margraf et al., 2017). Fourth, the sheer presence of physicians during the flight may have been perceived as a safety signal by some patients; especially in those with primary agoraphobic fears concerning the flight. Finally, albeit a large number of patients was treated at the same time which can be considered very time efficient, one could also criticise that the professional by patient ratio during the exposure flight still was 1:5 which is comparable to that reported for small group approaches targeting FoF.

In conclusion, the here reported data suggest that an exposure-based LG-OST targeting clinically relevant FoF represents a time efficient and highly effective treatment option. Therefore, it can be considered as an equivalent alternative to single- and small-group treatments in treating clinically relevant FoF.

Funding

The authors received no funding from an external source.

CRediT authorship contribution statement

André Wannemueller: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Visualization, Supervision. **Svenja Schaumburg:** Methodology, Formal analysis, Investigation, Writing - original draft, Project administration. **Sally Tavenrath:** Methodology, Investigation. **Alina Bellmann:** Methodology, Investigation. **Katharina Ebel:** Methodology, Investigation. **Tobias Teismann:** Investigation. **Sören Friedrich:** Investigation. **Jürgen Margraf:** Conceptualization, Supervision.

Declaration of competing interest

None.

Acknowledgements

We would like to thank Alice Abramski, Katharina Ackermann, Kirsten Chroczewski, Carolin Cording, Marie Czech, Sonja Fröhlich, Verena Grieβer, Denise Hecker, Katrin Hötzel, Janine Jostmeier, Paola Kahlert, Lea Koch, Karen Krause, Maike Küppers, Alla Machulska, Farbod Mandegari, Frank Meyer, Milena Meyers, Verena Pflug, Anna Sheverdina, Dana Siempelkamp, Katharina Sommer, Tina Totzeck, Theresa Ullmann, Laureen von Bode, Katharina Westermann, Marcella Woud, Shagiram Yasotharan, Julia Zachlehner and the flight captain Peter Rosenkranz and his crew for their great and professional help in dealing with the patients and conducting the exposure flight.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2020.103735.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders*(5th ed.). Washington, DC: American Psychiatric Association.

Becker, E. S., Rinck, M., Türke, V., Kause, P., Goodwin, R., Neumer, S., et al. (2007). Epidemiology of specific phobia subtypes: Findings from the dresden mental health study. *European Psychiatry, 22*, 69–74. https://doi.org/10.1016/j.eurpsy.2006.09.006.

BPtK. (2018). Ein Jahr nach der Reform der Psychotherapie-Richtlinie – wartezeiten 2018. https://www.bptk.de/wp-content/uploads/2019/01/20180411_bptk_studie_wartezeiten_2018.pdf, Accessed date: 4 May 2020.

Cohen, J. (1988). *Statistical power analysis for the behaviors science* (2nd ed.). Hillsdale: New Jersey: Laurence Erlbaum Associates, Publishers.

Depla, M. F., ten Have, M. L., van Balkom, A. J., & de Graaf, R. (2008). Specific fears and phobias in the general population: Results from The Netherlands mental health survey and incidence study (NEMESIS). *Social Psychiatry and Psychiatric Epidemiology, 43*, 200–208. https://doi.org/10.1007/s00127-007-0291-z.

Essau, C. A., Conradt, J., & Petermann, F. (2000). Frequency, comorbidity, and psychosocial impairment of specific phobia in adolescents. *Journal of Clinical Child Psychology, 29*, 221–231. https://doi.org/10.1207/S15374424jccp2902_8.

Götestam, K. G. (2002). One session group treatment of spider phobia by direct or modelled exposure. *Cognitive Behaviour Therapy, 31*, 18–24. https://doi.org/10.1080/16506070252823625.

Gursky, D. M., & Reiss, S. (1987). Identifying danger and anxiety expectancies as components of common fears. *Journal of Behavior Therapy and Experimental Psychiatry, 18*, 317–324. https://doi.org/10.1016/0005-7916(87)90045-0.

Haug, T., Brenne, L., Johnsen, B. H., Berntzen, D., Götesam, K.-G., & Hugdahl, K. (1987). A three-systems analysis of fear of flying: A comparison of a consonant vs a non-consonant treatment method. *Behaviour Research and Therapy, 25*, 187–194. https://doi.org/10.1016/0005-7967(87)90045-3.

Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., & Fang, A. (2012). The efficacy of cognitive behavioral therapy: A review of meta-analyses. *Cognitive Therapy and Research, 36*, 427–440. https://doi.org/10.1007/s10608-012-9476-1.

Lang, P. J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 16*, 495–512. https://doi.org/10.1111/j.1469-8986.1979.tb01511.x.

Laux, L., Glanzmann, P., Schaffner, P., & Spielberger, C. D. (1981). *Das state-trait-angst-inventar*. Beltz Test GmbH Weinheim.

Li, S. H., Newby, J., & Graham, B. M. (2020). Day at the museum. A benchmarking and feasibility study for large group, one-session exposure treatment for spider phobia. *Australian Psychologist, 55*, 121–131. https://doi.org/10.1111/ap.12425.

Lovibond, P. F., & Lovibond, S. H. (1995). *Manual for the depression anxiety stress scales* (2nd ed.). Sydney: Psychology Foundation.

Margraf, J., & Cwik, J. C. (2017). *Mini-DIPS open access: Diagnostisches Kurzinterview bei psychischen Störungen. Bochum: Forschungs-und Behandlungszentrum für psychische Gesundheit, Ruhr-Universität Bochum.* https://doi.org/10.13154/rub.102.91.

Margraf, J., Cwik, J. C., Pflug, V., & Schneider, S. (2017). Strukturierte klinische Interviews zur Erfassung psychischer Störungen über die Lebensspanne. *Zeitschrift für Klinische Psychologie und Psychotherapie, 46*, 176–186. https://doi.org/10.1026/1616-3443/a000430.

McNally, R. J., & Louro, C. E. (1992). Fear of flying in agoraphobia and simple phobia: Distinguishing features. *Journal of Anxiety Disorders, 6*, 319–324. https://doi.org/10.1016/0887-6185(92)90003-.

Mühlberger, A. (2003a). Angsterwartungsfragebogen bei Flugreisen (AES). In J. Hoyer J, & J. Margraf (Eds.). *Angstdiagnostik: Grundlagen und Testverfahren* (pp. 406–408). Berlin: Springer.

Mühlberger, A. (2003b). Gefahrenerwartungsfragebogen bei Flugreisen (GES). In J. Hoyer, & J. Margraf (Eds.). *Angstdiagnostik: Grundlagen und Testverfahren* (pp. 443–445). Berlin: Springer.

Mühlberger, A., Herrmann, M. J., Wiedemann, G., Ellgring, H., & Pauli, P. (2001). Repeated exposure of flight phobics to flights in virtual reality. *Behaviour Research and Therapy, 39*, 1033–1150. https://doi.org/10.1016/S0005-7967(00)00076-0.

Mühlberger, A., & Pauli, P. (2011). *Flugangst-und flugphobie-inventar: FAPI; manual.* Hogrefe: Göttingen.

Mühlberger, A., Wiedemann, G., & Pauli, P. (2003). Efficacy of a one-session virtual reality exposure treatment for fear of flying. *Psychotherapy Research, 13*, 323–336. https://doi.org/10.1093/ptr/kpg030.

Nilges, P., & Essau, C. (2015). Die Depressions-Angst-Stress-Skalen: Der DASS – ein Screeningverfahren nicht nur für Schmerzpatienten. *Schmerz, Der, 29*, 649–657. https://doi.org/10.1007/s00482-015-0019-z.

Oakes, M., & Bor, R. (2010). The psychology of fear of flying (part II): A critical evaluation of current perspectives on approaches to treatment. *Travel Medicine and Infectious Disease, 8*, 339–363. https://doi.org/10.1016/j.tmaid.2010.10.002.

Öst, L. G. (1996). One-session group treatment of spider phobia. *Behaviour Research and Therapy, 34*, 707–715. https://doi.org/10.1016/0005-7967(96)00022-8.

Öst, L. G., Brandberg, M., & Alm, T. (1997). One versus five sessions of exposure in the treatment of flying phobia. *Behaviour Research and Therapy, 35*, 987–996. https://doi.org/10.1016/S0005-7967(97)00077-6.

Öst, L. G., Ferebee, I., & Furmark, T. (1997). One-session group therapy of spider phobia: Direct versus indirect treatments. *Behaviour Research and Therapy, 35*, 721–732. https://doi.org/10.1016/S0005-7967(97)00028-4.

Rothbaum, B. O., Anderson, P., Zimand, E., Hodges, L., Lang, D., & Wilson, J. (2006). Virtual reality exposure therapy and standard (in vivo) exposure therapy in the treatment of fear of flying. *Behavior Therapy, 37*, 80–90. https://doi.org/10.1016/j.beth.2005.04.004.

Santos, E., Palma, H., Nápoles, G., Romero, R., Gabriel, R., Grilo, V., et al. (2011). Earn your wings program. *Aviation Psychology and Applied Human Factors, 1*, 61–69. https://doi.org/10.1027/2192-0923/a000010.

Schindler, B., Abt-Mörstedt, B., & Stieglitz, R. D. (2017). Flugangst und Flugphobie: Stand der Forschung. *Verhaltenstherapie, 27*, 35–43. https://doi.org/10.1159/000456024.

Shiban, Y., Diemer, J., Müller, J., Brütting-Schick, J., Pauli, P., & Mühlberger, A. (2017). Diaphragmatic breathing during virtual reality exposure therapy for aviophobia: Functional coping strategy or avoidance behavior? *BMC Psychiatry, 17*, 1–10. https://doi.org/10.1186/s12888-016-1181-2.

Spielberger, C., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual of the state-trait-anxiety inventory*. Palo Alto: CPP Inc.

Van Gerwen, L. J., Diekstra, R. F., Arondeus, J. M., & Wolfger, R. (2004). Fear of flying treatment programs for passengers: An international update. *Travel Medicine and Infectious Disease, 2*, 27–35. https://doi.org/10.1016/j.tmaid.2004.01.002.

Van Gerwen, L. J., Spinhoven, P., Diekstra, R. F., & Van Dyck, R. (2002). Multicomponent standardized treatment programs for fear of flying: Description and effectiveness. *Cognitive and Behavioral Practice, 9*, 138–149. https://doi.org/10.1016/S1077-7229(02)80007-4.

Van Gerwen, L. J., Spinhoven, P., & Van Dyck, R. (2006). Behavioral and cognitive group treatment for fear of flying: A randomized controlled trial. *Journal of Behavior Therapy and Experimental Psychiatry, 37*, 358–371. https://doi.org/10.1016/j.jbtep.2006.05.002.

Wannemueller, A., Appelbaum, D., Küppers, M., Matten, A., Teismann, T., Adolph, D., et al. (2016). Large group exposure treatment: A feasibility study in highly spider fearful individuals. *Frontiers in Psychology, 7*, 1183. https://doi.org/10.3389/fpsyg.2016.01183.

Wannemueller, A., Fasbender, A., Kampmann, Z., Weiser, K., Schaumburg, S., Velten, J., et al. (2018). Large-group one-session treatment: A feasibility study of exposure combined with applied tension or diaphragmatic breathing in highly blood-injury-injection fearful individuals. *Frontiers in Psychology, 9*, 1534. https://doi.org/10.3389/fpsyg.2018.01534.

Wannemueller, A., Gruszka, P., Chwalek, S., Fröhlich, S., Mulders, M., Schaumburg, S., ... Margraf, J. (2019). Large-group one-session treatment: Feasibility in highly height fearful individuals and predictors of outcome. *Frontiers in Psychology, 10*, 2411. https://doi.org/10.3389/fpsyg.2019.02411.

Wannemueller, A., Jöhren, H. P., Borgstädt, A., Bosch, J., Meyers, M., Völse, M., & Margraf, J. (2017). Large group exposure treatment: A feasibility study of exposure combined with diaphragmatic breathing in highly dental fearful individuals. *Frontiers in Psychology, 7*. https://doi.org/10.3389/fpsyg.2016.02007.

Wannemueller, A., Moser, D., Kumsta, R., Jöhren, H. P., Adolph, D., & Margraf, J. (2018). Mechanisms, genes and treatment: Experimental fear conditioning, the serotonin transporter gene, and the outcome of a highly standardized exposure-based fear treatment. *Behaviour Research and Therapy, 107*, 117–126. https://doi.org/10.1016/j.brat.2018.06.003.

Wannemüller, A., Moser, D., Kumsta, R., Jöhren, H. P., & Margraf, J. (2018). The return of fear: Variation of the serotonin transporter gene predicts outcome of a highly standardized exposure-based one-session fear treatment. *Psychotherapy and Psychosomatics, 87*, 95–104. https://doi.org/10.1159/000486100.

Wardenaar, K. J., Lim, C. C., Al-Hamzawi, A. O., Alonso, J., Andrade, L. H., Benjet, C., ... de Jonge, P. (2017). The cross-national epidemiology of specific phobia in the World Mental Health Surveys. *Psychological Medicine, 47*, 1744–1760. https://doi.org/10.1017/S0033291717000174.

Wilhelm, F. H., & Roth, W. T. (1997a). Clinical characteristics of flight phobia. *Journal of Anxiety Disorders, 11*, 241–261. https://doi.org/10.1016/S0887-6185(97)00009-1.

Wilhelm, F. H., & Roth, W. T. (1997b). Acute and delayed effects of alprazolam on flight phobics during exposure. *Behaviour Research and Therapy, 35*, 831–841. https://doi.org/10.1016/S0005-7967(97)00033-8.

Wittchen, H. U., Nelson, C. B., & Lachner, G. (1998). Prevalence of mental disorders and psychosocial impairments in adolescents and young adults. *Psychological Medicine, 28*, 109–126. https://doi.org/10.1017/S0033291797005928.

Wolitzky-Taylor, K. B., Horowitz, J. D., Powers, M. B., & Telch, M. J. (2008). Psychological approaches in the treatment of specific phobias: A meta-analysis. *Clinical Psychology Review, 28*, 1021–1037. https://doi.org/10.1016/j.cpr.2008.02.007.