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A brief treatment for fear of heights: A randomized controlled trial of a novel imaginal intervention

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Abstract

Objective: To assess the effectiveness of a novel imaginal intervention for people with acrophobia.

Methods: The design was a randomized controlled trial with concealed randomization and blinded to other participants' intervention. The intervention was a single novel imaginal intervention session or a 15-min meditation. The setting was in Auckland, New Zealand. The participants were a convenience sample of the public with a score >29 on the Heights Interpretation Questionnaire (HIQ), a questionnaire validated against actual height exposure. The primary outcomes were the proportion of participants with a score <26 on the HIQ at eight weeks and difference between the HIQ scores between the two arms of the study.

Results: Ninety-eight participants (92%) returned their questionnaire and were included in the intention to treat analysis. The HIQ score <26 was 34.6% (18/52) in the intervention group and 15.2% (7/46) in the control group RR = 2.26,

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95% CI (1.05, 4.95) and $p = 0.028$. The numbers needed to treat is six 95% CI (3 to 36). Participants with scores <26 report their fear of heights is very much improved. There was a 4.5-point difference in the HIQ score at eight weeks ($p = 0.055$) on the multiple regression analysis.

Conclusions: This is the first randomized trial of this novel imaginal intervention which is probably effective, brief, easily learnt, and safe. It may be worth considering doing this prior to some of the longer or more expensive exposure therapies. This study will be of interest to family doctors, psychiatrists, and psychologists.

Keywords
phobia disorders, clinical trial, acrophobia, single-blind method, primary health care

Introduction

Phobias are common with about 6.4% of a German population having a lifetime prevalence of acrophobia (fear of heights).[1] Thirteen percent of patients presenting to their general practitioners have phobias and 2.4% are situational phobias which include height phobias.[2] Specific phobias cause distressing anxiety often leading to avoidance of specific triggers. Treatments frequently can be suboptimal given poor engagement or dropout due to the number of sessions required and the cost of treatment. Therefore, consideration of an alternative, rapid, yet effective intervention is worth pursuing.

There are many interventions for acrophobia ranging from desensitization[3,4] to in-vivo exposure[5–8] and virtual reality.[9–16] They range in participant time for 20[9] to 90[17] min per session, from 1[18] to 14[3] visits, and total therapeutic time from 36[18] to 315 min.[15] We were aware of a novel imaginal intervention adapted from the so-called neurolinguistic programming rapid phobia cure which was claimed to be effective in a 15-min visit.[19] Our aim was to test this novel imaginal technique with participants with a fear of heights to see if it was more effective than a control intervention at eight weeks in terms of a reduced score on the Heights Interpretation Questionnaire (HIQ) and other outcomes.[20]

Methods

The trial was a parallel two-arm randomized controlled trial with a 1:1 allocation ratio. Inclusion criteria was: HIQ score > 29; an ability to comprehend the information sheet and consent form.[20] The HIQ is a validated questionnaire that is a robust predictor of fear and avoidance of actual rather than imagined heights, beyond traditional psychological measures of acrophobia symptoms.[20] The HIQ describes two heights scenarios. One is a balcony on the 15th floor and the other a ladder against a two-story house. There are eight questions for each scenario such as "you will fall" and the participant has five possible answers of

not likely to very likely. The maximum score on the HIQ is 80 and the minimum score is 16 (no fear at all). A validation study found that the average score for a low fear of heights was 23.93, 26.3 for a medium fear of heights, and 55.99 for a high fear of heights.[20] A corrigendum published later reported that a low fear of heights was 21.27, medium fear 23.88, and 49.76 for a high fear of heights.[21] There were four study locations. The study was conducted according to the Consort guidelines 2010.[22]

Both arms of the trial received a relaxation exercise (the full script is available from the authors). This was done for safety reasons in case participants developed acute anxiety during the interventions. The intervention group received the novel imaginal intervention as described by Walker.[19] In summary, the participant is asked to make a black and white movie (black and white to symbolize an old past experience) of a time when they were very fearful of heights, in their imagination, and show it on a small movie screen. They watch the movie from the theatre seats and watch themselves watching the movie from the projection booth, i.e., a double dissociation. Once it has run through, they join ("enter") the film at the safe end, turn it to color (color makes it seem real and now), and run it backwards rapidly. They then return to their seat and the projection box. The movie can be repeated up to six times. The control group experienced a 15-min general meditation played on a smart phone using an MP3 audio from the CALM website.[23] The duration of the audio meditation was chosen to approximate the anticipated average time for the novel imaginal intervention duration. The intervention and control intervention were given at the first visit and there was no advice on what to do after the baseline visit. There were no more visits after that one and the outcome measure was done via email. The participants were a convenience sample obtained through advertising through the community and university email lists. The study was conducted in one primary care clinic and three university sites.

Training for the intervention

BA and SH spent 2 h developing the script for the relaxation tool and the novel imaginal intervention and having one trial run through the process. The script was used for the intervention and the control group and is available from the authors.

Outcomes

All outcomes were measured at eight weeks post-intervention and were pre-specified. The primary outcomes were the eight-week score on the HIQ between intervention and the control group and the proportion of participants who had an HIQ <26 in each group. The secondary outcomes were the dichotomous five-step outcome: very much improved, improved, no change, much worse, and very

much worse; the self-assessment of fear of heights on scale of 1 to 10 with 10 being very fearful of heights and one low and the mean anxiety (GAD-7) score between the groups. The GAD-7 is a validated general anxiety inventory used increasingly in primary care.[24] The GAD-7 was included to determine if the participants were anxious at the baseline and to ascertain if the intervention made any difference to overall anxiety. At eight weeks after the baseline intervention interview, the study investigators emailed the participants with the end of study questionnaire to ensure the replies were blind.

Sample size

The sample size was based on an absolute reduction of a 30% effect size from 60% of participants having a fear of heights in the control group to a 30% fear of heights in the intervention group with an alpha of 0.05 and a beta of 0.2. This required a total of 96 participants (48 in each arm). There was no provision for any interim analysis.

Randomization and potential biases

Concealed randomization was done using a website with a built-in random number generator. Allocation was done after the baseline measurements had been completed and the next consecutive study number was entered into the website. On submitting the number, the website reported the words ''intervention'' or ''control.'' The interviewers (BA or SH) then administered the intervention or control procedures accordingly. The participants were blinded to the intervention they did not receive. They were told that, being a research study, they would discover the intervention they were not getting when they had completed the questionnaire at the end of the study. This was done to avoid resentful demoralization whereby those who get the control intervention either drop out or their reported subjective feelings are more negative than would be if not aware of their allocation.[25] At the end of the intervention or control procedures, the participants signed a ''certificate of validation'' confirming that the interviewers had not influenced the response of the participants. The participants were asked to say that they were not aware that the intervention they did not get was any better than the one they got and that the interviewers had not influenced how the participants responded to the questions. This was done to guard against any criticism of influence or advocacy on the part of the authors.

Analysis

The analysis was done by intention to treat analysis. Categorical outcomes were expressed using counts (percentages) and compared between treatment groups using the chi-squared test. Continuous variables were expressed using mean

(standard deviation) and compared between groups using an analysis of variance. The secondary outcome of GAD was expressed in medians and compared between groups using the Mann–Whitney *U* test. The multivariate models for the dichotomous outcomes were evaluated using logistic regression to calculate odds ratios (which were converted to risk ratios using the formula of Zhang) with confidence intervals. The continuous outcomes were analyzed using multiple linear regression. All multivariate models controlled for age and gender (and the baseline level of HIQ for the primary outcome of HIQ). A two-tailed p value < 0.05 was considered to be significant. Statistical analysis was performed using SAS V.9.3 (SAS Institute Inc., Cary, North Carolina, USA). Ethical approval was obtained from the Health and Disability Ethics Committee 14/NTA/23 on 11 April 2014 Wellington, New Zealand.

Results

Ninety-eight participants (92%) returned their questionnaire and were included in the intention to treat analysis, and two participants withdrew from the study leaving the 105 potential participants for analysis. We planned to recruit 10 extra participants to compensate for withdrawals (we actually had 11 extra). The required sample size was 96 participants (see flow chart Figure 1 for the recruiting flow). The first participant was randomized on 28 August 2014 and the last one on 1 July 2015. The baseline characteristics are shown on Table 1. The eight-week outcomes are shown on Tables 2 and 3. The univariate primary continuous outcome was statistically significant but the multivariate was marginally non-significant ($p = 0.055$). One participant was erroneously given the intervention when she was randomized to the control group. When this was taken into account, the per protocol analysis was statistically significant at $p = 0.043$. The median number of showings of the movie was four with a range of one to six. A post hoc analysis was done using the score <30 which was the inclusion threshold for the study and corresponded to those who reported their symptoms had improved.

Harms

None of the participants reported that their fear of heights became worse. Two participants withdrew.

Discussion

Summary

The primary dichotomous outcome of the proportion of participants with a score <26 (34.6% in the intervention group and 15% in the control group)

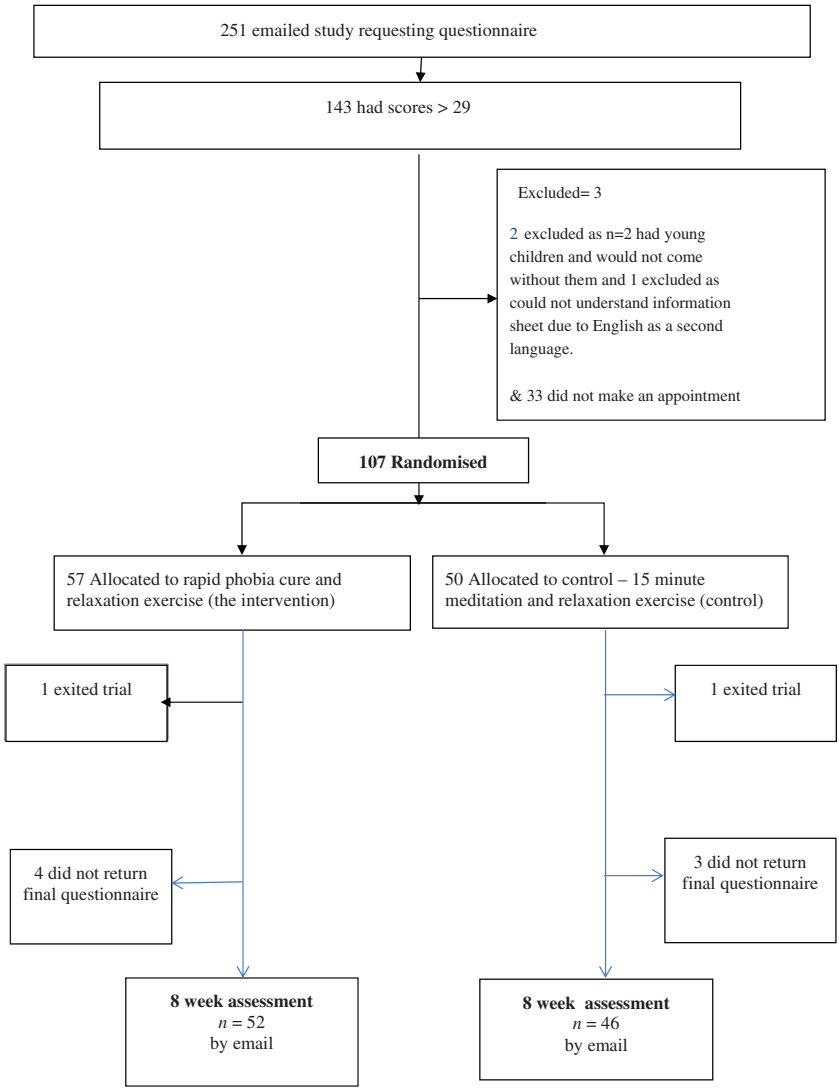

Figure 1. Consort flow chart.

was statistically significant on both the univariate analysis ($p = 0.028$) and the multivariate analysis ($p = 0.035$). The number needed to treat for this is six 95% CI (2.8 to 35.5). The 20% effect size may be an underestimate as the control group was more active than a treatment as usual or waiting list controls. In the post hoc analysis for a score of <30 (the study inclusion criterion), the number

Table 1. Baseline characteristics.

	Intervention (n = 57)	Control (n = 50)
Female[a]	44 (77.2%)	38 (76.0%)
Age[b] (SD)	42.3 (15.5)	43.0 (15.5)
Age range	17 to 76 years	20 to 68 years
Ethnicity European[a]	40 (70.2%)	34 (68.0%)
Ethnicity Chinese[a]	5 (8.8%)	3 (6.0%)
HI questionnaire (HIQ)[b]	50.4 (10.7)	53.1 (12.7)
HIQ range	33 to 80	31 to 79
GAD-7[10] Mean (SD)	6.4 (4.48)	5.76 (3.63)
GAD-7 median and (range)	6 (0 to 18)	5.5 (0 to 17)
GAD-7 score $\geq$10[c]	10	4
Duration of fear of heights –months median (range)	360 (60 to 840)	360 (36 to 720)
Duration of fear of heights months mean (SD)	369.6 (203.5)	377.2 (177.8)
Fear of height 1 to 10[d] median and (range)	8 (3 to 10)	8 (1 to 10)
Fear of heights mean (SD)	7.86 (1.32)	8.04 (1.43)

Note: (xx%): Proportions.
[a]Data are counts.
[b]Data are mean (SD).
[c]GAD 7 score $\geq$ 10 signifies a significant anxiety condition.
[d]10 worst fear and 1 no fear at all.

needed to treat was five 95% (CI 2.3 to 13.8). Our interpretation of a score <26, based on our data, is that participants at this level would be experiencing a very much improved fear of heights and at <30 would have an improved fear of heights. We found a marginally non-significant reduction in the HIQ of 4.5 points ($p = 0.055$) on the multivariate analysis. The average score at baseline was 50 which is in the high fear of heights range. While there was a trend in favor of the intervention for the secondary dichotomous outcome variable, it was not statistically significant. One of the secondary outcome findings of no difference in the GAD-7 score is not surprising as a phobia is a specific state-like fear and the majority of participants did not have elevated anxiety at baseline. Overall four of the five pre-specified outcome measures were in the direction of a benefit for the phobia cure as an effective treatment. Two were statistically significant, one was marginally non-significant, and one was not significant. The duration of the fear of heights was recorded and reported to show that most of the participants had acquired their fear of heights in childhood as the median years since the onset of their phobia was 30 years and the average age was about 43 years.

Table 2. Dichotomous outcomes at eight weeks.

	Intervention N = 52	Control N = 46	Univariate model (p value)	Multivariate model (p value)	NNT
Primary outcome					
HIQ score <26 (%)	18 (34.6%)	7 (15.0%)	0.028	RR = 2.26, 95% CI = (1.05, 4.95), p = 0.035	– 6, 95% CI = (2.8, 35.5)
Secondary outcome					
very much and much improved(%)	35 (67.3%)	25 (54.3%)	0.189	RR = 1.24, 95% CI = (0.89, 1.67), p = 0.199	NS –
Post hoc outcome					
HIQ score <30 (%)	27 (51.9%)	12 (26.1%)	0.014	RR = 2.04, 95% CI = (1.19, 4.10), p = 0.009	4, 95% CI = (2.3, 13.8)

Note: NNT: numbers needed to treat; NS: not significant; RR: relative risk; (xx%): Data are counts.

Table 3. Continuous outcomes at eight weeks.

	Intervention N = 52	Control N = 46	Univariate model (p value)	Multivariate model (p value)
Primary outcome				
HI questionnaire (HIQ) (SD)[a]	31.9 (11.5)	37.2 (12.2)	Mean difference = 5.3, 95% CI = (.56, 10.07), p = 0.029	Mean difference = 4.5, 95% CI = (−.09, 9.0), p = 0.055
Secondary outcomes				
Fear of heights (1 to 10[a])	4.8 (2.2)	5.8 (1.9)	Mean difference = 0.92, 95% CI = (.08, 1.75), p = 0.032	Mean difference = 0.91, 95% CI = (.07, 1.74), p = 0.033
GAD-7 median (range)	4.0 (0 to 16)	4.0 (0 to 15)	0.970	NS
GAD-7 score ≥10	8	7	(0.98)	NS
GAD-7 mean (SD)	4.9 (4.1)	5.1 (4.3)	0.83	NS

Note: NS: not significant; HIQ: Heights Interpretation Questionnaire.
[a]Data are mean (SD).

Strengths

The strengths of this study are that it is a randomized controlled trial with all potential sources of internal validity bias addressed. The study had randomized allocation with concealment, an intention to treat analysis, each intervention group was blinded to the activity of the other (thereby minimizing resentful demoralization), and blinded assessment of outcome.[26] There was also the certificate of validation to guard against undue influence from the interviewers. It was registered with the Australian and New Zealand Clinical Trials Registry.

Limitations

The limitations of the study are the outcome assessment was done at only eight weeks. Our clinical experience is that if participants maintain their reduced fear of heights at eight weeks, it is likely to be permanent, and a longer period of study may have resulted in a lower response rate for the final questionnaire. While it would have been desirable to have a final test of behavioral avoidance, the majority of participants said they would not have participated in the study had there been any exposure to real heights. Recruitment took almost one year and any further barriers to recruitment may have made achieving an adequate sample size problematic. The ''threat'' of a behavioral assessment may hinder recruitment, and excluding participants unwilling to be exposed to a real height assessment situation would introduce a selection bias. The HIQ validation study has been validated against actual heights so is likely a good measure of actual experience. Participants were seen in four different geographical regions and standardizing a test of behavioral avoidance would have been problematic. We chose not to do a behavioral assessment based on consideration of these issues. The difference between the univariate and multivariate analysis for the primary continuous outcome and the marginal non-significance of the multivariate analysis implies insufficient power for this variable. The power calculations were, however, done on the dichotomous outcomes.

Comparison with existing literature and clinical experience

A literature search from the Cochrane Depression Anxiety and Neurosis group on December 2015 found 15 randomized trials as treatments for acrophobia with more than 20 participants.[3–12,14–16,18,27] Eleven of these papers had fewer than 40 participants and the largest had 88 participants. All the studies required more than one visit with some needing 12 sessions. The duration of each visit ranged from 20 to 60 min. Our study has the advantage of requiring a short intervention time (typically 15 min in total clinical time) and costing only the therapist's time. Our sample of 107 is the largest for randomized trials of acrophobia. In our study, 67.3% of participants reported feeling their fear of heights was very much improved or much improved which is consistent with our clinical experience.

Our speculation as to the mechanism of how this intervention works is that it is a form of exposure therapy that encourages visualization of the trigger while rapidly exposing the participant to the feared stimulus from a safe and dissociated place (the movie theatre seats and the projection box) and supports the participant with detaching any distress related to the trigger. It is similar to exposure therapy using virtual reality equipment but does not require the purchasing of expensive virtual reality goggles and software and the advantage of the participant using their own experience of a fearful height rather than a situation programmed and chosen by the investigators.[10–12,15] The participants were from a convenience sample and cannot be specifically generalized to clinical patients with fear of heights, but the study has high internal validity and hence we believe we can have confidence in the results.

Implications for research

It is important that this study be replicated by other authors. We feel our design is an exemplar of a study of high internal validity for a treatment that cannot be administered blind to participants and hope that other investigators could replicate our design. It would also be useful for studies to investigate other specific phobias.

Implications for practice

Height phobias are a common problem in primary care and this novel imaginal technique is probably an effective treatment that is easily learnt, takes less than 15 min to conduct, is safe, and relatively inexpensive. Other treatments can be time consuming and/or expensive and are often not in the realm of a medical practitioners to conduct. Other health care practitioners working with patients with phobias may wish to use this as a first line treatment due to its brevity. This study will be of interest to family physicians, psychiatrists, and psychologists.

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Author Contributions

BA, SH, and FS conceived and designed the trial. DK created the remote randomization programme. VM was the data manager. SH was the psychological consultant and AP provided biostatistical advice and analysis. HW searched the literature and assessed all

the papers. All coauthors were involved in the interpretation of the results and in reviewing the manuscript.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: All authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author).

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