**A pilot study investigating the Feasibility, Reach-Out, Acceptability, Fidelity, and Efficacy of a Group Laughie Intervention on the Well-being of Earthquake Survivors in Türkiye**

**Abstract**

Mental health and quality of life may be negatively impacted among earthquake survivors. This pilot study evaluates the use of and reports on the preliminary effects of participating in a one-minute Laughie (Laugh Intentionally Everyday) Laughter Prescription on well-being in earthquake survivors in Türkiye. A Group Laughie intervention was deliveredusing a within-subject (n=20; M age = 34.78 ± 6.65; 14 female) pretest-posttest design. Group Laughies were delivered once a day over two-weeks with participants prescribed to further laugh with the Group Laughie recording twice a day, resulting in three minutes of intentional laughter daily. Data were collected using a range of questionnaires including the Laughie Checklists to track fidelity, a Post-Intervention Perceived Impact Measure (PIPIM) in the form of the Positive Psychology One-off Post-intervention measure (PPOP), and the World Health Organisation (WHO-5) well-being index. Results indicated high intervention fidelity using Laughie Checklists and positive post-intervention perceived impact using the 0 to 10 (11-point Likert) scaled PPOP (*x* = 7.62±1.44). After the intervention, a statistically significant difference (*p*<0.001) was found between WHO-5 well-being index pre-test scores (*x* = 2.16±1.00) and post-test (*x* = 4.08±0.24). This study demonstrated beneficial effects of the Laughie prescription on earthquake survivors. This is the first intervention to explore the feasibility of an online Group Laughie intervention. Health professionals and especially nurses can use the one-minute Laughie prescription in the form of a Group Laughie intervention to increase the well-being of individuals and improve perceived mental health.

**Keywords** Earthquake survivors, Laughter, Group Laughie prescription, mental health, well-being, pilot study.

1. **Introduction**

Earthquakes represent one of the most common disasters triggered by natural hazards, with the potential to cause significant destruction and disruption (United Nations,2020). They are responsible for a considerable number of casualties, substantial economic loss and can hinder and undo societal development. Earthquake exposure is associated with psychological distress and the development of post-traumatic stress disorder (PTSD; Livanou et al., 2005). In 2023, 1,712 earthquakes with a magnitude of five or greater were recorded worldwide (Statista Research Department, 2023). Due to its tectonic location, Türkiye is almost entirely on fault lines, thousands of earthquakes of different magnitudes occur yearly. The year with the greatest number of earthquakes recorded was 2023, with over 74,000 tremors registered (Statista Research Department, 2023). Among these earthquakes, on 6 February 2023, two earthquakes of magnitude 7.7 and 7.6 occurred consecutively on the same day, centered in two districts of Kahramanmaraş. The Kahramanmaraş earthquakes, also known as the disaster of the century, were recorded as amongst the most severe in Türkiye (Avcil, et al, 2023). Following their eruption, a series of aftershocks were recorded. The earthquakes had a direct impact on 11 provinces and an indirect impact on many others. According to official records, more than 50,000 people lost their lives, and over 100,000 were injured (Türkiye Disaster and Emergency Management Authority; AFAD 2023).

A qualitative study conducted six months after an earthquake in Iran with vulnerable groups (women, children, older people, and people with disabilities) revealed that feelings of anxiety and worry were observed in all four vulnerable groups as well as fear, overexcitement and avoidance (Forouzan et al., 2013). The persistence and exacerbation of psychological distress symptoms, as well as the potential progression of existing mental health issues following earthquakes, highlight the pressing need for mental health interventions and psychosocial support activities (Ahmed et al., 2023; Kurt et al., 2023). In the aftermath of a disaster, interventions are required to mitigate mental health problems and increase well-being (Güler et al., 2024).

Laughter is an attractive low-risk and low-cost intervention to improve health and well-being (Gonot-Schoupinsky et al., 2020). The one-minute Laughie (Laugh Intentionally Everyday) Laughter Prescription is particularly practical due to its rapidity and feasibility in increasing well-being in health adults (n=20) (Gonot-Schoupinsky & Garip, 2019a). Group Laughies have recently been used by a laughter professional in citizen science research (Gonot-Schoupinsky et al., 2024). Here, the feasibility and acceptability of online Group Laughies are explored in earthquake survivors in Türkiye.

**Objectives**

The main objective in this article is to present findings from a pilot study where we evaluated the feasibility, reach-out, acceptability, fidelity, and efficacy of the Laughie (Laugh Intentionally Everyday) Laughter Prescription intervention, in the form of online Group Laughie, aimed at improving the well-being of earthquake survivors in Türkiye.

**Research Questions**:

Our objectives were underpinned by seven research questions inspired by our use of the FRAME-IT (Feasibility, Reach-out, Acceptability, Maintenance, Efficacy, Implementation, and Tailorability) framework (Gonot-Schoupinsky & Garip, 2019b). We present findings for the first five here. Question 6 is covered in a Brief Report (Kuru Alici et al. 2024) and Question 7 is covered in a qualitative paper in preparation.

1. Feasibility: Is it feasible to administer the Laughie intervention in the form of online Group Laughies to earthquake survivors in Türkiye?
2. Reach-out: Is the Laughie intervention appropriate for earthquake survivors in Türkiye?
3. Acceptability: How acceptable was a 14-day Group Laughie prescription involving 3 minutes of intentional laughter per day?
4. Maintenance: Did participants demonstrate fidelity to maintaining their laughter prescription?
5. Efficacy: What is the preliminary effect of the Laughie intervention on the well-being of earthquake survivors in Türkiye?
6. Implementation: How can the Group Laughie intervention best be implemented?
7. Tailorability: How can the Group Laughie intervention be tailored, overall and individually, for optimal impact?
8. **Methods**

**Study design**

A pilot study using a within-subjects pretest-posttest quasi-experimental design was used to evaluate the effects of a Group Laughie intervention on well-being in earthquake survivors in Türkiye. Mixed methods quasi-experimental pilot studies are helpful to gain insight prior to a larger-scale trials (e.g. Santini et al., 2024). Due to the volume of material to communicate, results pertaining to this study are covered in three articles. An overview of the intervention Implementation, or protocol (Kuru Alici et al., 2024) has been published to enable intervention replication. A qualitative analysis using Differential Qualitative Analysis (Gonot-Schoupinsky & Garip, 2019c) is in preparation.

**Participant recruitment**

This study was conducted with participants living in neighbouring provinces of the earthquake in Kahramanmaraş, Türkiye. Snowball sampling was used to recruit participants. The inclusion criteria were (i) aged 18 to 65 years and (ii) ability to use smart devices. The sample consisted of 20 (14 female, 6 male) participants. For similar feasibility studies, the recommendation sample size is 12 participants per group (Julious, 2005). The demographic data of the participants are presented in Table 1.

**Ethical considerations**

This study was approved by the Human Research Ethics Committee of a public University in Türkiye. Written and verbal informed consent was obtained from all participants. Participants were informed that they could withdraw from the study at any time, without explanation.

**Intervention planning and evaluation**

Research was planned and evaluated using the FRAME-IT framework previously introduced, and as shown in Table 1.

Table 1. Intervention planning and evaluation using FRAME-IT

|  |  |  |  |
| --- | --- | --- | --- |
| **FRAME-IT Constructs** | **Assessment focus** | **Principal Measures used for evaluation** | **Focus on this Paper** |
| Feasibility | Feasibility of administering a Group Laughie intervention | * Laughie Experience Questionnaire * Laughie checklists * Interviews1 | Yes |
| Reach-out | Population suitability for earthquake survivors | * Demographic Questionnaire * Earthquake Questionnaire * Interviews1 | Partial1 |
| Acceptability | Perceived acceptability of the intervention for the participants | * Laughie Experience Questionnaire * PPOP (Positive Psychology One-off Post-intervention measure)2 | Yes |
| Maintenance | Fidelity of participant adhesion to the intervention | * Laughie checklists * Interviews1 | Yes |
| Efficacy | Post-intervention increases in well-being | * WHO (5) Wellbeing Measure * PPOP2 * Interviews1 | Yes |
| Implementation | Recommendations as to how to implement intervention | * Interviews1 * PI recommendations1 | No13 |
| Tailorability | Recommendations for tailoring the intervention | * Interviews1 * PI recommendations1 | No1 |

Notes. 1. Qualitative results are reported in a second paper (in progress) using Differential Qualitative Analysis (Gonot-Schoupinsky and Garip, 2019). 2. The PPOP was the PIPIM (Post-Intervention Perceived Impact Measure) used in this intervention. 3. Covered in Kuru alici et al., 2024.

**Measures**

Six measures were used to evaluate the research:

1. **Demographic Questionnaire**

The demographic questionnaire consisted of descriptive questions including age, gender, marital status, health status and laughter frequency prepared by the researchers by utilizing the literature. Participant demographic data is presented in Table 2.

1. **Earthquake Questionnaire**

Earthquake exposure was assessed using a 4-item questionnaire proposed by Fan et al. 2011. This captures exposure by four-items: (1) death, disappearance and/or injury of family members; (2) house damage; (3) property loss; and (4) direct witness of traumatic events. The question for exposure 1 had 5 choices: 1 = death of a family member, 2 = missing family member, 3 = serious injury of a family member, 4 = moderate injury of a family member, and 5 = none of the above. If two or more choices were selected, the lower/lowest number (indicating higher/highest level of exposure) was coded. For exposures 2–4, each question was rated on a 5-point Likert scale, with 1 indicating the highest level of exposure and 5 being the lowest (Fan et al., 2011). Data gathered here is briefly summarized in the Results section and Table 3. Our application of the scale causes the following categories to evaluate exposure level: 16-20 = Low; 11-15 = Medium; Under 10= High.

1. **Laughie Checklists**

Following the Group Laughie participants noted whether they enjoyed it, and whether they laughed for the full minute, or at least for 30 seconds. Participants were prescribed to laugh with their Group Laughie twice a day. Similarly, and in addition, participants noted if they enjoyed laughing with the Group Laughie and whether they laughed for the full minute, or at least 30 seconds, after each time. This resulted in data from 840 Laughie experiences (3 x 14 x 20). This data is briefly summarized in the Results section.

1. **Laughie Experience Questionnaire**

The Laughie Experience Questionnaire (Gonot-Schoupinsky et al., 2024) was recently conceived by one of the authors as a descriptive post-intervention questionnaire. Here we adapted it to this intervention and administered it to draw out the participant’s Laughie experience, to understand intervention acceptability, and ultimately feasiblity. Participants were asked to respond to questions such as “I enjoyed the 14-day Laughie prescription overall”; and “I enjoyed the daily group Laughie sessions” using a 5-point Likert scale (I absolutely agree, I agree, I am not sure, I disagree, I absolutely disagree). The questionnaire was adapted from one developed for Laughie citizen science research (Gonot-Schoupinsky et al., 2024), which used a six-point Likert scale but no “I am not sure” category). We summarized the results in the agree column by combining absolutely agree and agree responses. These results are presented in Table 3 as percentages.

1. **Post Intervention Perceived Impact Measure (PIPIM): the PPOP**

The PIPIM (Gonot-Schoupinsky et al., 2024) is a new descriptive generic post-intervention descriptive measure designed to draw out intervention perceived impact (IPI) by aligning all questions to the intervention being used. Here, the PIPIM used was an adapted version of the PPOP (Positive Psychology One-off Post-intervention measure) conceived by one of the authors and first applied in citizen science research (Gonot-Schoupinsky et al., 2024). The PPOP consists of 20 questions including “Do you feel more happy and cheerful after using the Laughie for 14 days” and “Do you have more energy after using the Laughie for 14 days”. PIPIMs use an 11-point Likert scale: “A great deal less; A lot less; A fair bit less; A little less; A tiny bit less; The same; A tiny bit more; A little more; A fair bit more; A lot more; A great deal more”. The results of the PPOP are presented in Table 5 as means.

1. **WHO Five Well-Being Index (WHO-5)**

The WHO-5 Well-being Index (WHO-5; World Health Organization, 1998), a widely used and validated measure, was administered pre- and post-intervention as a self-report well-being measure. Eser et al. validated and established the reliability of the WHO-5 Turkish scale in their 2019 study. Based on guidance from Eser et al. (2019), the WHO-5 Turkish scale could be used without seeking explicit permission, provided it was cited appropriately. The scale consists of five items (e.g. 'In the last two weeks, I have felt cheerful and in good spirits') rated on a 6-point Likert scale grading; At no time=0, some of the time=1, less than half of time=2, more than half of time=3, most of the time=4, all of the time=5. The scoring of the scale is done by summing the score obtained from each item, and the highest score that can be obtained from the scale is 25 and the lowest score is 0. The Cronbach alpha internal consistency coefficient of the scale was found to be 0.81 in the Turkish validation study. In the present study, Cronbach’s alpha was 0.83. These results are presented in Tables 6 and 7.

**Intervention**

The primary investigator (PI), a trained nurse, experienced laughter professional, Laughie practitioner and certified laughter yoga instructor, administered the intervention. Instructions for the Laughie are explained in more detail in Kuru Alici et al., 2024. The essential ones are that participants 1) aim to laugh joyfully and naturally; 2) laugh for a reason that they want to focus on, such as to increase energy, or happiness; 3) recognize that practice and training can help; 4) enjoy the Laughie as they wish, so with others, alone, thinking of funny things. The virtual Group Laughie sessions were conducted using the Zoom platform. Participants met once a day and laughed together for one minute to create a Group Laughie each day, for 14 days. The PI recorded the Group Laughie and sent it to all participants following each session. Participants were prescribed to laugh with the Group Laughie twice a day, thus ensuring they were laughing for 3 minutes a day. Participants who were unable to attend the daily Group Laughie session were prescribed to laugh with the Group Laughie 3 times a day or record their own Laughie and laugh with it twice a day. This ensured that every participant laughed for 3 minutes each day, a total of 42 minutes, and Laughie experiences, over 14 days. Further details about the administration of this intervention are found in Kuru Alici et al., 2024.

**Data analysis**

Results of the Laughie Experience Questionnaire are presented as percentages. The PPOP which uses a 11-point scale is presented as means. WHO-wellbeing data obtained through research was analyzed using SPSS 24 statistical analysis program. The results obtained were tested at p<0.01 significance level and bidirectionally. Mean ± standard deviation, number and percentage representation and median minimum-maximum values were used for descriptive statistics. For further analysis, a Kolmogorov Smirnov normality test was applied to the WHO-5 Index. Paired Sample t-test was used to analyze the difference between pre and post scores. Cohen's d was used to calculate effect sizes.

1. **Results**

Firstly, we present an overview of general participant profiling data: demographic data and the Earthquake Exposure Four-Item questionnaire results in Table 2. Then we investigate results for the first five of the FRAME-IT parameters are narrated, with a focus on Feasibility, Acceptability, Maintenance and Efficacy, and initial findings on Reach-out.

As seen in Table 2, the mean age in this study was 34.78 years, with the majority (70%) of participants female. A third of participants reported laughing up to 5 times a day, and 20% laughing more than 20 times a day. The majority of participants (70%) reported laughing alone each day, although 30% reported never doing so. Just under half (45%) of participants reported feeling happy in the last two weeks, but 30% strongly disagreed to that statement. Three participants reported a chronic disease. As seen in Table 2, Our application of the scale uses the following categories to evaluate exposure level: 16-20 = Low; 11-15 = Medium; Under 10= High. Most of participants (75%) had experienced low earthquake exposure.

Table 2. Demographic Data

|  |  |  |
| --- | --- | --- |
| **Age** | **X ± SD** | |
| 34.78 ±6.65 | |
|  | ***N*** | ***%*** |
| **Gender** | | |
| Female  Male | 14  6 | 70.0  30.0 |
| **Marital status** | | |
| Single  Married | 9  11 | 45.0  55.0 |
| **Health Status1** | | |
| Yes  No | 3  17 | 15.0  85.0 |
| **How often do you usually laugh daily?** | | |
| Never  1 to 5 times a day  6 to 10 times a day  11 to 20 times a day  more than 20 times a day | -  7  5  4  4 | -  35.0  25.0  20.0  20.0 |
| **Do you ever laugh alone?** | | |
| Never  1 to 5 times a day  6 to 10 times a day  11 to 20 times a day  more than 20 times a day | 6  9  2  2  1 | 30.0  45.0  10.0  10.0  5.00 |
| **I felt happy most of the last two weeks** | | |
| Strongly agree  Agree  Not sure  Disagree  Strongly disagree | 3  6  5  6  - | 15.0  30.0  25.0  30.0  - |
| Earthquake exposure |  |  |
| Low  Medium  High | 15  5  - | 75.00  25.00  - |

Note. 1. "Health Status" refers to whether participants reported having a chronic illness or condition

**Feasibility**

The Feasiblity of administering a Group Laughie intervention was measured by participant attendance and fidelity to the intervention (measured using Laughie Checklists) and by the Laughie Experience Questionnaire (Table 3).

Participants attended most of the 14 daily Group Laughie meetings. Laughie Checklists showed high self-reported participant fidelity – thus also feasibility - for laughing for 3 minutes each day. These results are discussed in “Maintenance”.

Results of the Laughie Experience Questionnaire are found in Table 3. Most participants (95%) self-reported completing the Laughie prescription, albeit a minority (15%) found the intervention to be too long.

Table 3. Summary of results of the Laughie Experience Questionnaire:

|  |  |
| --- | --- |
| **Laughie Experience Questionnaire (n = 20)** | **Agree** |
| 1. I enjoyed the 14-day Laughie Prescription overall | 100% |
| 2. I enjoyed recording my Laughie each day | 90% |
| 3. I enjoyed the daily Group Laughie session | 100% |
| 4. I enjoyed laughing with my Laughie each day | 100% |
| 5. I think the Laughie is a good laughter prescription | 100% |
| 6. I completed all or most of the 14-day Laughie prescription | 95% |
| 7. I thought the 14-day prescription was too long | 15% |
| 8. I think the Laughie could be prescribed by medical doctors | 95% |
| 9. I noticed several physical health benefits using the Laughie | 90% |
| 10. I noticed several mental health benefits using the Laughie | 95% |
| 11. I noticed several social benefits using the Laughie | 95% |
| 12. I noticed several personal development benefits using the Laughie | 95% |
| 13. I noticed several behavioural benefits using the Laughie | 95% |
| 14. Looking at other people's Laughies was helpful to me | 100% |
| 15. I found my Laughie and laughter improved over time | 95% |
| 16. I found using the ‘Laughie Techniques’ helpful | 100% |
| 17. I enjoyed listening to my laughter most of the time | 95% |
| 18. I found my laughter helped me laugh and was contagious | 100% |
| 19. I enjoyed sharing my Laughie with friends and family | 100% |
| 20. I found laughing with my Laughie easier as time progressed | 100% |

Source. Adapted from Gonot-Schoupinsky et al. (2024).

**Reach-out**

Preliminary results suggest that this intervention is suitable for participants with a similar demographic profile and Earthquake Exposure (Table 2) of participants in this study.

**Acceptability**

Perceived acceptability of the intervention was self-reported using the Laughie Experience Questionnaire (Table 3) and a Post Intervention Perceived impact measure (PIPIM) in the form of the PPOP (Positive Psychology One-off Post-intervention measure (Table 4).

As seen in Table 3, all participants enjoyed the intervention overall, all enjoyed the Group Laughie, all enjoyed laughing with their Laughie, and thought the Laughie was a good prescription pointing to high acceptability of the intervention.

Overall results of the PPOP also suggest high acceptability as the 20 questions ask respondents to rate their perceived impact of the intervention on a range of positive health and wellbeing outcomes. By directly linking the questions to the intervention itself, the PPOP is therefore potentially suitable to gain insight into intervention acceptability.

Table 4 Descriptive results of Post Intervention Perceived Impact Measure

|  |  |
| --- | --- |
|  | **X ±SD** |
| 1. Do you feel more happy and cheerful after using the Laughie for 14 days? | 8.25±1.25 | |
| 2. Are you thinking more clearly after using the Laughie for 14 days? | 7.65±1.63 | |
| 3. Is your sleep better (better quality) after using the Laughie for 14 days? | 7.55±1.93 | |
| 4. Do you feel more anxious after using the Laughie for 14 days? | 2.85 ± 3.10 | |
| 5. Are you planning to be more active after using the Laughie for 14 days? | 8.00±1.78 | |
| 6. Are you more confident after using the Laughie for 14 days? | 7.85±2.08 | |
| 7. Do you feel more joyful after using the Laughie for 14 days? | 8.25±1.25 | |
| 8. Do you feel more self-compassionate after using the Laughie for 14 days? | 8.15±2.16 | |
| 9. Do you have more energy after using the Laughie for 14 days? | 8.35±1.42 | |
| 10. Do you feel more optimistic after using the Laughie for 14 days? | 8.25±1.59 | |
| 11. Do you feel more resilient after using the Laughie for 14 days? | 7.70±2.11 | |
| 12. Do you feel more contented with life after using the Laughie for 14 days? | 7.85±2.01 | |
| 13. Do you feel more lonely after using the Laughie for 14 days? | 1.55 ± 2.63 | |
| 14. Do you feel more connected to others after using the Laughie for 14 days?2 | 1.85±2.54 | |
| 15. Are you socialising more easily after using the Laughie for 14 days? | 8.10±2.07 | |
| 16. Do you feel your health is better after using the Laughie for 14 days? | 7.85±2.16 | |
| 17.Are you more relaxed after using the Laughie for 14 days? | 8.05±1.36 | |
| 18.Do you feel more angry after using the Laughie for 14 days? | 1.35 ± 2.28 | |
| 19. Do you enjoy alone time more after using the Laughie for 14 days? | 6.60±3.14 | |
| 20.Do you feel more compassionate towards others after using the Laughie for 14 days? | 8.25±1.62 | |
| OVERALL with Questions 4, 13, and 18 inversed1 | 7.62±1.44 | |

Note: 1. Questions 4, 13, and 18 are worded negatively, and are inversed in the Overall Mean to enable overall data comparison: Q. 4: 7.00±3.09; Q. 13: 8.45±2.62; Q. 18: 8.45±2.62. 2. Notable and related to different interpretations of words in Turkish, the perception of being connected to others was seen as less of a beneficial outcome than the perceived impact of becoming more autonomous.

**Maintenance**

The Maintenance parameter was measured by investigating the fidelity of participant adhesion to the intervention. Analysis of the Laughie Checklists showed that out of the total of 840 Laughie experiences (1 recorded per day and 2 laughing along: 3 per day for 14 days for 10 participants), 87% of the 840 Laughie experiences were reported for the full one-minute, and 99% for more than 30 seconds. Thus, most participants laughed for 3 minutes a day, and up to 42 minutes in total, over a period of 14 days.

**Efficacy**

The Efficacy parameter was measured using the descriptive PPOP (Table 4) and the validated WHO-5 Wellbeing Index (Tables 5 and 6).

As seen in Table 5, the overall perceived impact of the intervention was positive (M 7.62) with Means of 8.0 and above reported included those on feeling more happy and cheerful after the intervention, planning to be more active after the intervention, feeling more joyful after the intervention, and also having more energy.

Table 5 and 6 shows the comparison of the group pre-post test scores of the WHO-5 Well-Being Index. Following the Group Laughie prescription, there was a statistically significant difference between the pre-test (2.16 ± 1.00) and post-test (4.08 ± 0.24) in the mean scores of the WHO-5 (p<0.01) and the effect size (d. 1.133) was large.

Table 5. The average of each WHO-5 Well-Being Index item pre-post group laughie

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Pre- Group Laughie** | | | **Post- Group Laughie** | | |
| *Over the last two weeks;* | **X±SD** | **Max** | **Min** | **X± SD** | **Max** | **Min** |
| 1) I have felt cheerful and in good sprits | 2.35±1.27 | 4.00 | 1.00 | 4.40±0.50 | 5.00 | 4.00 |
| 2) I have felt calm and relaxed | 2.35±1.35 | 5.00 | 1.00 | 4.15±0.37 | 5.00 | 4.00 |
| 3) I have felt active and vigorous | 1.95±1.28 | 4.00 | .00 | 4.05±0.69 | 5.00 | 3.00 |
| 4) I woke up feeling fresh and rested | 1.70±1.45 | 4.00 | .00 | 3.55±0.69 | 4.00 | 2.00 |
| 5) My daily life has been filled with things that interest me | 2.45±1.15 | 4.00 | .00 | 4.25±0.44 | 5.00 | 4.00 |

Table 6. Comparison of the group pre-post test scores of the WHO-5 Well-Being Index

|  |  |  |  |
| --- | --- | --- | --- |
| **WHO-5 Well-Being Index** | **X± SD** | **t p** | **Cohen’s *d*  = 1.133** |
| Pre-Group Laughie | 2.16±1.00 | -7.572; p<0.001. |
| Post-Group Laughie | 4.08±0.24 |

1. **Discussion**

This is the first study to test the feasibility, reach-out, acceptability, maintenance (fidelity), and efficacy of using the Laughie prescription in a vulnerable population. It is also the first study to test Group Laughies (where groups of people laugh together for one minute) in this intervention managed by the PI, while recording that laughter virtually.

The Feasibility, Reach-out, Acceptability, Maintenance, Efficacy, Implementation, and Tailorability (FRAME-IT) frame-work supported the planning and evaluation of this intervention. The Feasibility, Acceptability, Maintenance and Efficacy of the Laughie prescription and the use of Group Laughies in this vulnerable population (i.e. the Reach-out) was established by the PI and reflected in data from self-reports using the Laughie Checklists, the Laughie Experience questionnaire, a PIPIM in the form of the PPOP, and the WHO (5) Wellbeing measure.

Participants in this group were young adults (M age = 34.78), most participants (14) were female, and 3 reported a chronic condition. Most of the participants had damage to their property and witnessed traumatic events; one had a family member die. Interestingly, two-thirds of the participants reported laughing more than six times a day prior to the intervention. In an article with 52,320 participants investigating the frequency of laughter after the Great East Japan Earthquake, only 27.1% of the participants reported laughing almost every day (Hirosaki, et al., 2018). Our results suggest that the addition of one-minute of intentional laughter, three times a day, was highly beneficial to this vulnerable population.

**Feasibility** of the intervention was established: most participants completed the entire Laughie prescription, attended all the Group Laughie sessions, and demonstrated high fidelity in laughing for three minutes a day.

**Reach-out** of the intervention to other earthquake survivor populations with a similar profile to those in this study, can thus be assumed, but due to the small sample size must be considered with caution.

**Acceptability** of the intervention was established, with all participants reporting that they enjoyed the intervention overall. Responses to the Laughter Experience Questionnaire revealed that all participants reported to have enjoyed the 14-day prescription overall, found their laughter to be contagious, and enjoyed sharing their Laughie with friends and family. The vast majority also perceived physical, mental, social, behavioral, and personal development benefits following the intervention.

**Maintenance**, or participant adhesion to laughing for 3 minutes a day, was high, as reported in the Laughie Checklists, and Laughter experience Questionnaires. Most participants laughed for 3 minutes a day, and up to 42 minutes in total, over a period of 14 days. Because laughter therapies rarely track how long participants laugh for (Gonot-Schoupinsky et al., 2020), laughter adhesion data is valuable information to help understand what the minimum effective dose of laughter can be to increase well-being in vulnerable populations. As most laughter therapies tend to focus on longer sessions, for example laughter yoga sessions often range between 30-minutes to 100-minutes (Kuru Alici & Donmez, 2020), the efficacy of a one-minute laughter prescription is of interest for practical reasons. The Laughie prescription used in this intervention included one minute of group laughter, managed and recorded by the PI, and then 2 minutes of laughter where participants were prescribed to laugh with the recording, alone or with people of their choice. This intervention was practical as none of the participants had to attend any physical course as the one-minute of group laughter was conducted virtually. The intervention is also practical for researchers as confounding factors often associated with other laughter therapies (such as the inclusion of exercises) are omitted. This research shows that the minimum effective dose of laughter for people in vulnerable populations may be quite low, however more research is needed.

**Efficacy**

Results from the WHO-5 Well-Being Index show a statistically significant difference in wellbeing, with a large effect size, large following the Group Laughie prescription.

Laughter interventions can be effective for promoting well-being (Lyle, 2023). A mixed-methods feasibility study (n = 21; aged 25-93 years; healthy adults) found a 16% increase in overall reported well-being after using Laughie three times a day for one week (Gonot-Schoupinsky & Garip, 2019). As a result of long-standing evidence, laughter has been found to reduce the stress hormone cortisol (Ko et al., 2022; Kramer & Leitao, 2023) and epinephrine/adrenaline (Berk et al., 1989), which are associated with health and well-being. Most participants also self-reported using the PPOP that they perceived themselves as more happy and cheerful, more optimistic, and more resilient and contented with life following the intervention. Most participants also perceived themselves as less angry and many as less anxious. One of the more surprising and interesting outcomes was that most participants reported feeling less connected to others after the intervention. This result is viewed as a culturally positive one in Türkiye as it points to the participants gaining more independence and autonomy over managing their health with the Laughie.

**Future Avenues**

The Laughie Laughter Prescription presents a way to measure participant laughter. It is anticipated that this will be facilitated with an App that is in development. The advantage of this is that overall and individual results can be assessed more thoroughly.

The PIPIM, here in the form of a PPOP, would need more investigation. It was conceived to support an ideographic approach to data assessment, enabling data triangulation to dig deeper into results. As a generic measurement, the PIPIM can be tailored to gauge individual intervention perceived impact (IPI) by aligning each question to the intervention and to its duration. PIPIMs may provide additional information, as perceptions of interventions can affect their outcomes (e.g. Forneris et al., 2009), and it is not always possible or appropriate to administer pre-post-tests. By explicitly linking questions relating to outcomes to the intervention, we can gather information which can enable us to refine the intervention itself and tailor it to individual needs. The PIPIM provides a quantitative way of gathering and measuring participant perception of the intervention and it can be tailored to each intervention.

Finally, as this intervention can be seen as being of particular interest due to its time efficiency, and ability to be administered online, more research is necessitated. In this study we showed that only 14 minutes of on-line group laughter (and 42 minutes of total laughter) over 14 days there was a significant increase in well-being and the effect size (d. 1.133) was large. Further research using more participants, and a randomized control trial design is recommended.

**Limitations**

This study has numerous strengths while it also has some limitations. As this was an exploratory pilot study with vulnerable participants, a quasi-experimental design and the use of a non-randomized convenience sample was preferred. To draw out appropriate intervention insight at this early stage of intervention testing, we relied on informative descriptive measures to widen insight, including two new questionnaires (The Laughie Experience Questionnaire and the PPOP). The Earthquake measure (Fan et al., 2011) is also not a validated measure; in this research we sought to advance its usage when considering low, medium, and high earthquake exposure categories. Future studies should incorporate more validated measures. It is important to note that due to the small sample size and the quasi-experimental design used, these results may not be generalizable to all earthquake survivors. Future research should include participants with a wider range of earthquake exposure. In addition, by increasing the sample size and demographic diversity, the external validity of the findings can be increased. This will make the findings more applicable to the wider population of earthquake survivors. Finally, the study was conducted one year after the earthquake. Since well-being can change over different time periods, the interpretation of the results should consider the temporal context. Future research should include longitudinal studies that track well-being at several intervals after the earthquake to explore the longevity of the current findings.

**Conclusions**

This research suggests strong feasibility, acceptability, maintenance (fidelity) and efficacy of the Laughie laughter prescription, administered in a group format, in a vulnerable population of earthquake survivors (reach-out) in Türkiye. Earthquake survivors are at high risk of mental health issues, and therefore it is of great importance to find practical interventions that can be easily and rapidly deployed. In our research we showed for the first time the efficacy of a Group Laughie intervention administered virtually and taking only a few minutes of time each day for the healthcare provider to manage. Only three minutes of laughter per day, one of which was managed and recorded by a nurse and Laughie practitioner, over two weeks, was shown in this research to have a significant impact on well-being in a vulnerable population. This highlights the potential of short, structured laughter sessions as a powerful tool for improving mental health in communities affected by crisis.

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