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# A French-language Web-based intervention targeting prolonged grief symptoms in bereaved and separated people: A randomized controlled trial

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## Abstract

**Background:** Losing a loved one, through death or separation, counts among the most stressful life events and is detrimental for health and well-being. About 15% of people show clinically significant difficulties in coping with such an event. Web-based interventions (WBIs) are effective for a variety of mental health disorders, including prolonged grief. However, no validated WBI is available in French for treating prolonged grief symptoms.

**Objective:** We aimed to compare the efficacy and adherence rates of two WBIs for prolonged grief symptoms following the loss of a loved one through death or romantic separation.

**Methods:** LIVIA 2.0 was developed relying on theoretical and empirical findings on bereavement processes and WBIs, and is compared with LIVIA 1, which has already demonstrated its efficacy. We conducted a randomised controlled trial and provided on-demand guidance to participants. Outcomes were assessed exclusively through online questionnaires at pretest, posttest (12 weeks later), and follow-up (24 weeks later). Primary outcomes are grief symptoms, depressive symptoms, and eudemonic well-being. Secondary outcomes are anxiety symptoms, grief coping strategies, aspects related to self-identity reorganization, and program satisfaction.

**Results:** 62 participants were randomized (Intent-To-Treat – ITT sample), 29 in LIVIA 2.0 (active arm) and 33 in LIVIA 1 (control arm). The drop-out rate was 56.5%, leading to a final Per Protocol (PP) sample of 27 completers who differed from non-completers only on reporting less anxiety symptoms ($t_{(60)} = 3.03$, $p = .004$). Separated participants reported more grief symptoms ($t_{(60)} = 2.22$, $p = .03$) and attachment anxiety ($t_{(60)} = 2.26$, $p = .03$), compared to bereaved participants. There were pre-post within group differences for both LIVIA programmes in the ITT sample, with significant reductions in grief (*d=-.90*), depressive (*d=-.31*), and centrality of the loss (*d=-.45*). The same pattern was

observed in the PP sample, with the exception that anxiety symptoms also significantly diminished (*d*=-.*45*). No difference was found in efficacy between the two programmes (all *p* > .33). Participants (ITT sample) reported overall high levels of programme satisfaction (*M* = 3.18, *SD* = .54, over a *max*. = 4). Effect stability was confirmed at the 6-month follow-up for all outcomes, self-concept clarity even improving.

**Conclusions:** The two grief-related WBIs were effective to diminish grief, depressive and anxiety symptoms for bereaved and separated participants. The analyses did not reveal any pre-post between-group differences, suggesting that the innovations brought to LIVIA 2.0 did not significantly affect the outcome compared to the original version. However, caution is warranted with the interpretation of the results given the limited power of the sample, which only allows the detection of medium effect sizes.

**Trial Registration:** The RCT protocol was published at https://www.researchprotocols.org/2022/6/e39026, and registered in the ClinicalTrials.gov database ("Trial Registration: ClinicalTrial.gov NCT05219760"; https://tinyurl.com/3dzztjts) and its International Registered Report Identifier (IRRID) is PRR1-10.2196/39026.



*Keywords*: Web-based interventions; randomized controlled trial (RCT); grief; bereavement; separation; guidance.

**A French-language Web-based intervention targeting prolonged grief symptoms in bereaved and separated people: A randomized controlled trial**

Distress following the loss of a loved one is a painful yet normal reaction. While most individuals recover over time, some experience prolonged grief symptoms, characterized by intense feelings of grief that persist for an extended period [1, 2]. Face-to-face interventions show moderate to large effect sizes to treat these symptoms [3, 4], but lack accessibility (e.g. [5, 6]. Web-based interventions (WBIs) can help improve accessibility and provide numerous efficient prevention and treatment programs for a variety of psychological difficulties [7, 8]. Notably, WBIs have demonstrated effectiveness in addressing prolonged grief symptoms, yielding moderate to large effect sizes [9, 10]. These interventions are generally based on methods derived from empirically supported face-to-face psychological interventions.

A common means to enhancing WBI effectiveness [11], including those targeting prolonged grief symptoms [9], is to provide guidance to participants (i.e., "any direct and bidirectional communication with the individual designed to support the clinical aspects of the intervention, facilitate intervention completion and/or achieve the desired clinical outcomes" [11], p. 230). However, recent evidence suggests that the impact of guidance on effect sizes is lower in more interactive internet interventions [12]. Additionally, when given the option, not all participants request guidance, yet the efficacy of a guidance on demand condition is similar to that of standard weekly guidance [13, 14].

LIVIA 1 is a WBI program designed to treat prolonged grief symptoms following bereavement or separation [15]. Fundamental research indicates that both types of losses involve very similar underlying processes (e.g. [16, 17]). LIVIA 1 was assessed in German through a randomized controlled trial (RCT) [18] and in French through a noncontrolled trial [19]. These studies demonstrated that the same intervention can be efficiently administered to

both populations. A detailed description of the LIVIA 1 intervention is available in the protocol by Brodbeck et al. [15].

For the present study, we developed LIVIA 2.0, an upgraded version of LIVIA 1. This program integrates recent developments in WBIs [20, 21] and incorporates various elements to enhance patient adherence and program efficacy whilst reducing the need for guidance. Specifically, a series of changes were designed to improve participant autonomy. First, we sent automated emails [22] in two situations: a) to announce to the participants that a new session is available and b) in case the participant has not accessed the intervention for seven consecutive days. Second, we more closely tailored the intervention to each participant in two ways: a) by providing automated individualized recommendations about the module completion order [23]; b) by proposing at each session a choice of different exercises that meet different situations or needs. More specifically, we evaluated at the first session each participant's priorities and recommended the order of the modules accordingly. In each session, we provided three choices of exercises so that the participant could chose what suited their needs best. Third, we evaluated, promoted and encouraged the use of personal resources based on a validated self-assessement tool, the AERES [21]. Finally, relying on research showing the benefits of augmented interactivity [20, 24, 25], we developed more interactive content in the form of psychoeducation videos and quizzes. Apart from the introductory and concluding sessions, the structure of LIVIA 2.0 revolves around four modules focusing on key cognitive-behavioural therapy topics: thoughts, behaviours and emotions. Moreover, we developed a module based on empirical cognitive psychopathological knowledge that addresses identity and memory processes, which are crucial for adapting to loss [26, 27]. Autobiographical memory refers to memories from past personal experiences. It serves to maintain self-continuity and provides the ability to stay oriented in the world and pursue goals [28, 29]. In the grief context, the loss of a significant other is often a life-changing event that can disrupt one's life story, sense of self, and future plans [27]. Addressing these disturbances

can therefore play a crucial role in alleviating prolonged grief symptoms by helping individuals develop a more adaptive and coherent sense of self. Given these considerations, we aimed to include measures of three key identity-related variables in our study: a) self-continuity, which refers to the perception of a coherent connection between one's past, present, and future self [30]; b) self-concept clarity, which refers to the clear and coherent understanding of one's own traits, beliefs, and values [31]; and c) event centrality, which refers to the extent to which individuals construct the traumatic event as a reference point to understand themselves and the world [32]. By doing so, we aim to provide a more comprehensive understanding of how the LIVIA interventions impact these facets of identity. An overview of the content of LIVIA 2.0 can be found in Table 1.

*Table 1.* Overview of the sessions and key content of the LIVIA 2.0 intervention (active arm) targeting prolonged grief in bereaved and separated individuals.

| Session | Module[s] | Theme | Content |
|---|---|---|---|
| 1 | Introduction | Psychoeducation + resources and goals assessment | Information about the self-help intervention, grief reactions, predictors, and treatment of prolonged grief.<br>Assessment of personal resources and goals in pursuing the intervention |
| 2 | Cognition-focused | Loss-oriented session | Information about the impact of negative thoughts on well-being and the typical negative thoughts experienced during difficult grief. Cognitive restructuration exercises. |
| 3 | | Restoration-oriented session | Information about secondary stressors and related thoughts. Importance of building positive thoughts as resources. Exercise to promote focus on positive aspects of one's own life. |
| 4 | Emotion-focused | Loss-oriented session | Information about the central role of emotions in the grieving process. Assessment of own emotional state. Auto-compassion exercises. |
| 5 | | Restoration-oriented session | Importance of experiencing positive emotions, even if only briefly. Hypnosis-like exercises to promote positive emotions. |
| 6 | Behaviour-focused | Loss-oriented session | Information about the typical vicious circle of avoidance in grief and the importance of confrontation to the avoided situations. Confrontation exercises. |
| 7 | | Restoration-oriented session | Importance of behavioural activation in line with one's own values. Assessment of values. Preparation of behavioural activation in line with one's own values. |
| 8 | Identity-focused | Loss-oriented session | Psychoeducation about identity formation and the way it is affected by grief. Exercise: revisiting memories and |

| | | | |
|---|---|---|---|
| | | | the relationship with the lost person with an independent sense of identity. |
| 9 | | Restoration-oriented session | Psychoeducation about the importance of autobiographical memory for the individual's sense of self and ability to generate images of future events. Exercise aimed at focusing on specific adaptive autobiographical memories and future projections to foster an independent self-identity. |
| 10 | Conclusion | Assessment of the experience the intervention + relapse prevention | Promoting reflection on one's own journey through the program (what was learned, what still needs to be done) + identification of vulnerable moments and strategies to deal with the latter. |

Note: Loss-oriented refers to focusing on thoughts and feeling related to the loss. Restauration-oriented refers to focusing on life changes and new roles or responsibilities following the loss. [a] Modules 2 to 9 can be completed in any order selected by the participants, based on the personalized recommendations provided by the programme at the end of Session 1.

The innovations in LIVIA 2.0 were also developed on the theoretical and empirical literature on grief and romantic dissolution. Theoretically, we relied on one of the most influential models of coping with loss, the Dual Process Model (DPM) of Coping with Bereavement [33, 34]. According to this model, instead of progressing through consecutive phases, individuals oscillate between focusing on loss-oriented thoughts and feelings and focusing on restoration from the loss (i.e. life changes and new roles or responsabilities following the loss). This oscillation is considered a natural and necessary process for coping with loss. Additionally, evidence suggests that DPM-based interventions may be more effective than traditional ones [35]. LIVIA 2.0 was designed to mimic the oscillation process by alternating between loss- and restoration-focused sessions within each of its four modules. Furthermore, LIVIA 2.0 incorporates recent empirical findings related to loss into its content and exercises, such as self-compassion exercises, which predict better grief recovery [36, 37]. Exploratory analyses of the utilization and potential impact of the innovations included in LIVIA 2.0 were conducted, in particular in relation to guidance requirements, automated e-mails, reliance on personal resources, and the identity module [38]. Given the combination of

empirically-based changes implemented in LIVIA 2.0, we expect it to be more efficient than LIVIA 1 when provided in a guidance on demand format.

### Objectives

Our main hypotheses are as follows: (1) both LIVIA 1 and LIVIA 2.0 will increase participants' well-being and decrease their mental health symptoms at post-test and follow-up; (2) LIVIA 2.0 will be more efficient than LIVIA 1 across all outcomes; and (3) LIVIA 2.0 will have a lower dropout rate than LIVIA 1. Additionally, we will compare participant satisfaction between both versions.

These hypotheses were preregistered in a published protocol [39], although not all are addressed in the present study. First, the comparison of guidance requirements between LIVIA 2.0 and LIVIA 1, as well as part of the qualitative investigation of the semantic content of the responses to the LIVIA 2.0 exercises, are discussed in other publications [38, 40]. Second, the smaller sample size obtained, compared to the target, does not provide sufficient statistical power to analyse the short-term effectiveness of each LIVIA 2.0 module on participants' weekly moods, feelings of loneliness, and prolonged grief symptoms, nor to explore the role of multiple measures as moderators of the program's efficacy.

## Methods

This study is a monocentric, single-blinded, 2-arm RCT comparing the efficacy of two versions of a French-language WBI –LIVIA 1 and LIVIA 2.0 – designed to alleviate mental health symptoms and enhance the well-being of individuals experiencing prolonged grief symptoms following the loss of a loved one.

**Study conditions**

In both study conditions, participants received automated e-mails if they had not accessed the intervention platform for a week. Additionally, they could request guidance whenever needed.

LIVIA 1 is a 10-session self-help intervention designed to address prolonged grief symptoms resulting from the death of, or separation/divorce from, a romantic partner, as developed by Brodbeck and colleagues (for more information, see [15]). Participants are encouraged to complete one session per week, with each session estimated to take about one hour, working through exercises provided in downloadable PDF files. Each session includes various texts, audio files, exercises, and interactive quizzes, and must be completed in the prescribed order [39]. This intervention serves as the control condition and its efficacy has been previously demonstrated [18].

LIVIA 2.0 is a psychological WBI developed by the authors of this study, consisting of 10 sessions [39, 41]. Each session takes approximately 30-45 minutes to complete and it includes an introductory session, eight sessions divided into four modules, and a concluding session. The modules cover four main themes: cognitions, emotions, behaviours, and identity. Based on the results of a short questionnaire, an individual recommendation for the order of module completion is provided at the end of the introductory session. Theoretically anchored in the Dual Process Model [34], each module comprises a first session focused on loss and a second on restoration. Each session features psychoeducational information and three versions of an exercise related to the session's main theme. Participants are expected to complete at least one exercise per session, choosing the one that best suits them, though they can complete all the exercises if they wish. LIVIA 2.0 incorporates various exercises, texts, audio and video files, and interactive quizzes. Participants in this condition can access a maximum of one session per week and receive an automated e-mail when a new session

becomes available. This setup serves as the active condition in this study. Previous versions of the modules were qualitatively pretested on small samples as part of Master theses [42–47], and the intervention was adapted based on the results. The content of the intervention was frozen during the present trial. Both interventions were hosted on a website developed by RationalK SàRL.

**Recruitment**

Participants were recruited from French-speaking regions of Switzerland through various methods. Recruitment was conducted by contacting associations (e.g., grief- and divorce-related organizations, senior citizens groups, and neighbourhood associations), engaging with media outlets (radio, television, newspapers), distributing flyers in public locations (e.g., beauty salons, churches), emailing university student groups, promoting the study through social media (Facebook, Instagram), and posting advertisements on research facility websites. Recruitment lasted from May 2022 to January 2023, with the last participant completing the follow-up in August 2023. We concluded recruitment due to time and funding constraints. Our institutional affiliation was displayed on all recruitment material, including posters, website, social media posts, and flyers, and was mentioned in all media appearances, such as radio interviews and press articles. All participants were required to fill out an informed consent form, which they downloaded online along with an information sheet. We provided our contact information in multiple locations to ensure participants could easily reach out with any questions.

**Ethical considerations**

The research protocol was approved by a federally-recognised state ethics committee (*Commission cantonale d'éthique de la recherche sur l'être humain*, CER-VD, BASEC reference number: 2021-D0086) and the Swiss Agency for Therapeutic Products (Swissmedic; reference number: 102667545) in accordance with Swiss Ordinance 810.306 on

Clinical Trials with Medical Devices. The trial was registered in the ClinicalTrials.gov database (reference number: NCT05219760).

All participants were required to complete an informed consent form, which was made available for download online along with an information sheet. The content of these documents is available in the Supplementary file. Contact information was provided in multiple locations for participants to reach out to the research team with any queries. In accordance with Swiss legislation and ethical standards, participants were required to provide their signature on the informed consent form. Subsequently, participants were given the option to either scan and email the signed informed consent form or to send it by post.

To guarantee the highest level of participant safety, the suicidal risk of interested individuals was initially evaluated using the 5-item Suicidal Ideation Attributes Scale (SIDAS, [48]). Those who met the validated risk threshold ($\geq 20$, [49]) were excluded from participation and provided with information regarding the availability of appropriate support. Individuals with a low risk (SIDAS score 0-12) were automatically admitted for participation. For individuals with a medium risk (SIDAS score 13-19), a phone-based clinical interview was conducted to ensure an optimal assessment of suicidal risk and referral for appropriate treatment using the RUD (Risk-Urgency-Danger) procedure [50]. Furthermore, the assessment of suicidal risk and the aggravation of symptomatology (at least one standard deviation for grief and depressive symptoms) was conducted at the post-test and follow-up stages.

Personal (identifiable) data (name, phone number, e-mail address and birthdate) was asked on the ICF. This information was collected via email or mail and stored on a network-attached storage (NAS) system provided by the University of Lausanne. All other data were encrypted and stored on secure servers. Participants were not offered any form of compensation.

**Participants and Procedure**

Inclusion criteria were: a) having experienced bereavement or separation more than six months prior to participation, b) feeling the need for support to cope with the loss, c) being over 18 years old, d) having regular access to the internet and basic computer/Internet literacy, e) speaking French fluently, and f) having provided written approval of the informed consent form.

Exclusion criteria were: a) the presence of moderate to acute suicidality (assessed before the start of the programme), b) the presence of severe psychological or somatic disorders requiring immediate treatment, c) concomitant psychotherapy, d) the prescription or dosage change of psychoactive drugs in the month prior to or during the programme, e) the inability to follow the study procedures, and f) enrolment of the investigators, their family members, employees, and other dependent people.

Sample size and condition assignment: among the 232 individuals who clicked on the screening questionnaire whilst visiting the programme website, 137 were accepted into the study (see Figure 1). Seventy-three did not send back the informed consent form, and two did not complete the pre-test questionnaires, resulting in a total of 62 participants starting the programme. These participants will be included in the Intention-to-Treat (ITT) analyses. Out of these, 33 participants were randomized into the LIVIA 1 condition and 29 participants into the LIVIA 2 condition. We used the Randomization module in REDCap (Harris et al., 2009; Harris et al., 2019), which generates randomization automatically. We applied a single-blinded randomization strategy stratified according to gender and loss type (bereavement vs. separation), with randomization blocks of ten persons with an allocation of 1:1. Due to drop-outs and exclusions for not meeting inclusion criteria (starting another treatment during the programme (LIVIA 2.0: n=3; LIVIA 1: n=2), not completing at least one full session (LIVIA 2.0: n=3; LIVIA 1: n=2)), 27 participants were finally included into the per protocol (PP)

analyses (LIVIA 1: n=15; LIVIA 2: n=12). Measurement were taken at three points: pretest (T0), posttest (T1; 12 weeks after the pretest), and follow-up (T2; 12 weeks after the posttest). Participants who were randomized received a link to create an account on the intervention platform corresponding to their assigned intervention. They were then free to access the intervention at the pace they wished, although a weekly session was recommended.

**Primary outcome measures**

All outcomes were assessed via self-reported questionnaires that were completed online by participants on the REDCAP platform [51, 52] of the CHUV (Centre Hospitalier Universitaire Vaudois, the Lausanne University Hospital). Participants were invited to complete the different questionnaires through an e-mail containing an personalized link. If the questionnaires were not completed within a week, up to three reminder emails were sent at each stage (pre-test, post-test, and follow-up).

Prolonged grief symptoms were assessed with the Traumatic Grief Inventory Self-Report [53, 54]. This 18-item self-report measure assesses the presence of symptoms on a 5-point scale, ranging from 1 (never) to 5 (always) [53]. This inventory is designed to evaluate symptoms of persistent complex bereavement disorder, as defined in the Diagnostic and Statistical Manual of Mental Disorders (5th edition [1]), and prolonged grief disorder, as per the International Classification of Diseases (11th edition [55]). It demonstrates good reliability and validity in identifying individuals at risk for prolonged grief disorder.

Depression symptoms were assessed with the Patient Health Questionnaire-9 [56], a 9-item measure of depression with adequate reliability and validity [57]. This questionnaire assesses various depressive symptoms over the previous two weeks on a scale ranging from 0 (never) to 3 (almost every day).

Well-being was measured with the French version [58] of the Flourishing Scale [59], a brief 8-item instrument of self-perceived success in important life areas such as relationships,

self-esteem, purpose, and optimism. This scale assesses eudemonic well-being, a broader conception of conventional well-being measures. Participants responded to items such as "I lead a purposeful and meaningful life" on a scale ranging from 1 (strongly disagree) to 7 (strongly agree).

**Secondary outcome measures**

Anxiety symptoms were measured with the Generalized Anxiety Scale [60, 61] , which includes 7 items (e.g., "Feeling nervous, anxious, or on edge"). Participants rated the frequency of symptoms over the previous two weeks on a 4-point Likert scale (0 = not at all; 3 = nearly every day).

Feelings of loneliness were assessed with the University of California Los Angeles Loneliness Scale [62, 63] which contains 10 positive items (e.g., "I feel in tune with the people around me") and 10 negative items (e.g., "I lack companionship"). Participants responded on a 4-point scale (1 = never to 4 = often).

Identity-related concepts were evaluated with three different scales. First, the 12-item Self-Concept Clarity Scale in its French version [31, 64] assesses the clarity, consistency, and stability of self-beliefs. Participants answered on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Second, the Centrality of Event Scale [32], French version by Ceschi [65], assesses the extent to which a distressing life event serves as a reference point for personal identity and meaning attribution to other experiences. Responses were rated on a 5-point scale (1 = totally disagree to 5 = totally agree). Finally, three items assessed self-continuity [66]: "I am the same person as I always was," "With time a lot of things have changed, but I'm still the same person," and "I am a different person than I was in the past." These items were evaluated on a 5-point scale (ranging from 1 = does not apply to me at all to 5 = fully applies to me).

Finally, satisfaction with the programme was measured with a translated and adapted version of the Client Satisfaction Questionnaire adapted to Internet-based interventions (CSQ-I [67]). We included open-ended questions to obtain qualitative feedback on the intervention.

### Statistical Analysis

All analyses were conducted using SPSS (version 25). We performed both intention-to-treat (ITT) and per-protocol (PP) analyses. The ITT analyses included all participants randomized into one of the experimental conditions (N = 62), while the PP analyses included only those participants who completed all protocol requirements (N = 27; see [68]). For the descriptive characteristics of the sample at baseline, we tested differences between both experimental arms using t-tests for continuous variables and chi-square tests for categorical variables, based on the ITT sample. To test hypotheses 1) and 2), we employed multilevel mixed-effects models with repeated measures data to evaluate the efficacy of LIVIA 2.0 compared to LIVIA 1 and the stability of the effects. These models account for the dependency of the data and the correlation of repeated measures within individuals, utilising all available data from each participant and estimating parameters for missing values [69].

Due to difficulties in participant recruitment, our sample size was significantly smaller than targeted. Post-hoc analysis revealed that the statistical power of the PP sample was adequate (.80) to compute within-between person interactions for a medium effect size, but insufficient to detect small within-between effect sizes (.18) or medium between-person differences (.33). Consequently, we adapted the analyses and decided not to conduct most secondary analyses.

## Results

### Baseline Characteristics

Table 2 presents the socio-demographic characteristics of the randomized sample consisting of 62 French-speaking adults. Table 3 details the characteristics of the loss and the

personal state of the randomized participants. We compared the separated and bereaved participants at baseline on the characteristics outlined in Tables 2 and 3. Three differences emerged: separated participants reported more grief symptoms ($t_{(60)} = 2.22$, $p = .03$), higher attachment anxiety ($t_{(60)} = 2.26$, $p = .03$), and were more frequently in a current romantic relationship ($t_{(60)} = 4.75$, $p < .001$) compared to bereaved participants. No other significant differences were found. A Bonferroni correction yields an $\alpha = .004$. Hence, the differences can all be considered significant.

*Table 2.* Socio-demographic characteristics of the Intention-to-Treat sample at Pre-test for LIVIA 2.0 (active arm) and LIVIA 1 (control arm)

| | Total N=62 n(%) | LIVIA 2.0 n=29 n(%) | LIVIA 1 n=33 n(%) | Difference |
|---|---|---|---|---|
| Age (M, SD) | 45.2 (13.8) | 46.76 (14.28) | 43.85 (13.49) | *t(60)=-.82, p=.41* |
| Gender | | | | *$\chi^2(1)=.11$, p=.77* |
| Female | 48 (77.4%) | 23 (79.3%) | 25 (75.8%) | |
| Male | 14 (22.6%) | 6 (20.7%) | 8 (24.2%) | |
| Mother tongue | | | | *$\chi^2(1)=2.42$, p=.20* |
| French | 56 (90.3%) | 1 (3.4%) | 28 (84.8%) | |
| Other | 6 (9.7%) | 28 (96.6%) | 5 (15.2%) | |
| Currently in a relationship | | | | *$\chi^2(1)=.06$, p=1.00* |
| Yes | 31 (50%) | 14 (48.3%) | 17 (51.5%) | |
| No | 31 (50%) | 15 (51.7%) | 16 (48.5%) | |
| Education level | | | | *$\chi^2(5)=5.90$, p=.33* |
| Compulsory school | 1 (1.6%) | 0 (0.0%) | 1 (3.0%) | |
| Apprenticeship | 12 (19.4%) | 5 (17.2%) | 7 (21.2%) | |
| High school | 5 (8.1%) | 4 (13.8%) | 1 (3.0%) | |
| Technical college | 4 (6.5%) | 1 (3.4%) | 3 (9.1%) | |
| Higher professional education | 2 (3.2%) | 0 (0.0%) | 2 (6.1%) | |
| University | 38 (61.3%) | 19 (65.5%) | 19 (57.6%) | |
| Professional status | | | | *$\chi^2(4)=2.51$, p=.65* |
| Unemployed | 7 (11.3%) | 2 (6.9%) | 5 (15.2%) | |
| In training | 6 (9.7%) | 3 (10.3%) | 3 (9.1%) | |
| Part-time | 26 (41.9%) | 13 (44.8%) | 13 (39.4%) | |
| Full-time | 19 (30.6%) | 8 (27.6%) | 11 (33.3%) | |

| | | | |
|---|---|---|---|
| Other | 4 (6.5%) | 3 (10.3%) | 1 (3%) |

### Adherence to Treatment and Dropout Analysis

Among the 62 randomized participants, 37 (59.7%) completed the post-test measures. Additionally, five participants were exluded because they did not complete at least one entire programme session, and another five were excluded for starting psychotherapy during the programme. Consequently, the final sample of completers comprised 27 participants (43.5% of the randomized sample, no difference between both arms, $t_{(60)} = .32$, $p = .75$; see Figure 1), which is considerably less than what was planned (234 participants at posttest). Completers and non-completers only differed on anxiety symptoms, completers having reported fewer compared to non-completers ($t_{(60)} = 3.03$, $p = .004$).

*Table 3.* Characteristics of the Loss and Personal State of Intent-to-Treat Sample at Pretest

| | Total N=62 | LIVIA 2.0 n=29 n(%) | LIVIA 1 n=33 n(%) | Difference |
|---|---|---|---|---|
| Type of loss | | | | *$\chi^2(1)=.01, p=1.00$* |
| Death | 36 (58.1%) | 17 (58.6%) | 19 (57.6%) | |
| Separation | 26 (41.9%) | 12 (41.4%) | 14 (42.4%) | |
| Person lost | | | | *$\chi^2(4)=4.71, p=.76$* |
| Partner | 27 (43.5%) | 11 (37.9%) | 16 (48.5%) | |
| Mother | 13 (21%) | 5 (17.2%) | 8 (24.2%) | |
| Father | 6 (9.7%) | 3 (10.3%) | 3 (9.1%) | |
| Brother | 5 (8.1%) | 2 (6.9%) | 3 (9.1%) | |
| Child | 2 (3%) | 1 (3.4%) | 1 (3.0%) | |
| Other family member | 5 (8.1%) | 4 (13.8%) | 1 (3.0%) | |
| Friend | 1 (1.6%) | 1 (3.4%) | 0 (0.0%) | |
| Other | 3 (4.8%) | 2 (6.9%) | 1 (3.0%) | |
| Time since loss (years; M, SD) | 3.2 (6.4) | 4.28 (9.03) | 2.27 (2.17) | *t(30.93)=-1.17, p=.25* |
| Relationship length (years; M, SD) | 24.0 (17.4) | 23.7 (18.0) | 24.3 (17.2) | *t(22)=-.52, p=.61* |
| Loss expected | | | | *$\chi^2(4)=4.85, p=.32$* |

| | | | | |
|---|---|---|---|---|
| Not at all | 24 38.7%) | 11 (37.9%) | 13 (39.4%) | |
| A little | 14 (22.6%) | 7 (24.1%) | 7 (21.2%) | |
| Moderately | 8 (12.9%) | 6 (20.7%) | 2 (6.1%) | |
| A lot | 7 (11.3%) | 3 (10.3%) | 4 (12.1%) | |
| Completely | 9 (14.5%) | 2 (6.9%) | 7 (21.2%) | |
| Loss experienced | | | | $\chi^2(3)=.97, p=.82$ |
| Very negatively | 33 (53.2%) | 15 (51.7%) | 18 (54.5%) | |
| Negatively | 16 (25.8%) | 9 (31.0%) | 7 (21.2%) | |
| Neutral | 8 (12.9%) | 3 (10.3%) | 5 (15.2%) | |
| Positively | 5 (8.1%) | 2 (6.9%) | 3 (9.1%) | |
| Grief (sum) | 55.79 (12.17) | 56.0 (12.1) | 55.6 (12.4) | *t(60)=-.14, p=.89* |
| | 40% above clinical cut-off (≥ 59) | | | |
| Depression (sum) | 8.55 (4.64) | 9.17 (5.27) | 8.00 (4.02) | *t(60)=-.99, p=.32* |
| | Minor: 24% | | | |
| | Mild: 37% | | | |
| | Moderate: 27% | | | |
| | Moderately severe: 10% | | | |
| | Severe: 2% | | | |
| Anxiety | 1.21 (.78) | 1.31 (0.85) | 1.13 (0.72) | *t(60)=-.88, p=.38* |
| Well-being | 4.97 (.99) | 4.82 (0.92) | 5.10 (1.05) | *t(60)=1.09, p=.28* |
| Loneliness | 2.17 (.61) | 2.18 (0.63) | 2.16 (0.60) | *t(60)=-.132, p=.89* |
| Identity scales | | | | |
| Self-Concept Clarity | 3.16 (.83) | 3.27 (0.94) | 3.06 (0.73) | *t(60)=-.98, p=.33* |
| Centrality of Event | 3.73 (.95) | 3.72 (0.82) | 3.73 (1.06) | *t(60)=.02, p=.98* |
| Self-Continuity | 2.66 (.88) | 2.77 (0.76) | 2.57 (0.97) | *t(60)=-.91, p=.36* |

*Note*. Grief symptoms were assessed by using the Traumatic Grief Inventory; Depression symptoms were assessed by using the Patient Health Questionnaire (PHQ-9); Anxiety symptoms were assessed by using the General Anxiety Disorder-7 (GAD-7); Well-being was assessed by using the Flourishing Scale; Loneliness was assessed by using the UCLA Loneliness Scale; Identity scales used were the Self-Concept Clarity Scale, Centrality of Event Scale, and Self-Continuity items. LIVIA 1 is the control arm and LIVIA 2.0 the active arm.

### Overall Effects at Post-Treatment

Table 4 presents the results of the mixed-effects model analyses, the means and standard deviations for all outcomes for the ITT analyses. Several outcomes demonstrated pre-post within group differences. Indeed, both LIVIA programmes resulted in significant and large reductions in grief symptoms, medium reductions in depressive, and a medium effect size reduction in the perceived centrality of the loss at post-test. Anxiety symptoms showed a trend toward reduction, with a medium effect size. However, well-being, loneliness, self-concept clarity, and sense of self-continuity did not significantly change over the treatment period. Importantly however, no group-by-time interaction nor between group effect was found for any outcomes, indicating the pre-post within group differences were not different between the two programmes. Given the small sample size and low statistical power, it is likely that some small effects were undetected. The PP analyses results, detailed in the Supplementary Multimedia Appendix 1, showed a similar pattern except for anxiety symptoms, which only showed a fully significant reduction within-group.

*Table 4.* Within- and between- person effects of LIVIA 2.0 (active arm) and LIVIA 1 (control arm), and stability of these effects in the Intention-to-treat sample (N=62).

| | Pre-treatment | | Post-treatment | | Follow-up | | Pre-post within group[a] | Between group[a] | Time x treatment[a] | Post-follow-up[a] (N=22) |
|---|---|---|---|---|---|---|---|---|---|---|
| Domain | *M(SD)* | *n* | *M(SD)* | *n* | *M(SD)* | *n* | *β, t(df), p,* [95% CI], $d_{cohen}$ | *β, t(df), p,* [95% CI], $d_{cohen}$ | *β, t(df), p,* [95% CI] | *β, t(df), p,* [95% CI], $d_{cohen}$ |
| Grief | 3.18(0.71) | 62 | 2.59(0.69) | 41 | 2.46(0.77) | 32 | *β*=-.64, *t*(44.07)=-4.94, *p*<.001, [-.90; -.38], *d*=-.90 | *β*=.02, *t*(77.64)=.14, *p*=.89, [-.33; .38] | *β*=.21, *t*(44.18)=1.10, *p*=.28, [-.17; .59] | *β*=-.10, *t*(32.30)=-.71, *p*=.48, [-.40; .19], *d*=-.14 |
| LIVIA 2.0 | 3.19(0.73) | 29 | 2.69(0.64) | 19 | 2.64(0.61) | 15 | | | | |
| LIVIA 1 | 3.17(0.71) | 33 | 2.51(0.74) | 22 | 2.30(0.87) | 17 | | | | |
| Depression | 0.95(0.52) | 62 | 0.82(0.52) | 39 | 0.62(0.53) | 29 | *β*=-.16, *t*(40.63)=-2.07, *p*=.04, [-.32; .00], *d*=-.31 | *β*=.13, *t*(70.51)=.99, *p*=.32, [-.13; .39] | *β*=.01, *t*(40.72)=.07, *p*=.94, [-.22; .24] | *β*=-.07, *t*(27.78)=-.83, *p*=.41, [-.23; .10], *d*=-.13 |
| LIVIA 2.0 | 1.02(0.59) | 29 | 0.92(0.53) | 18 | 0.68(0.52) | 13 | | | | |
| LIVIA 1 | 0.89(0.45) | 33 | 0.73(0.50) | 21 | 0.58(0.56) | 16 | | | | |
| Anxiety | 1.21(0.78) | 62 | 0.96(0.72) | 38 | 0.72(0.70) | 29 | *β*=-.21, *t*(39.2)=-1.88, *p*=.07, [-.44; .02], *d*=-.28 | *β*=.17, *t*(68.92)=.90, *p*=.37, [-.21; .56] | *β*=-.001, *t*(19.13)=-.01, *p*=.99, [-.33; .33] | *β*=-.14, *t*(27.19)=-1.38, *p*=.18, [-.34; .07], *d*=-.18 |
| LIVIA 2.0 | 1.31(0.86) | 29 | 1.06(0.82) | 18 | 0.85(0.88) | 13 | | | | |
| LIVIA 1 | 1.13(0.72) | 33 | 0.87(0.61) | 20 | 0.62(0.53) | 16 | | | | |
| Well-being | 4.97(0.99) | 62 | 4.98(0.89) | 38 | 5.17(1.16) | 29 | *β*=.05, *t*(37.69)=.32, *p*=.75, [-.26; .35], *d*=.05 | *β*=-.27, *t*(68.46)=-1.12, *p*=.27, [-.77; .22] | *β*=-.07, *t*(37.60)=-.31, *p*=.76, [-.51; .38] | *β*=.21, *t*(30.45)=1.09, *p*=.28, [-.18; .60], *d*=.21 |
| LIVIA 2.0 | 4.82(0.92) | 29 | 4.69(0.79) | 18 | 4.76(0.66) | 13 | | | | |
| LIVIA 1 | 5.10(1.05) | 33 | 5.25(0.91) | 20 | 5.51(1.38) | 16 | | | | |
| Loneliness | 2.17(0.61) | 62 | 2.21(0.55) | 38 | 2.09(0.64) | 29 | *β*=-.09, *t*(39.57)=-1.04, *p*=.30, [-.28; .09], *d*=-.16 | *β*=-.02, *t*(69.81)=1.36, *p*=.89, [-.28; .32] | *β*=.15, *t*(39.49)=1.10, *p*=.28, [-.12; .42] | *β*=-.16, *t*(28.12)=-1.79, *p*=.08, [-.34; .02], *d*=-.27 |
| LIVIA 2.0 | 2.18(0.63) | 29 | 2.26(0.56) | 18 | 2.20(0.62) | 13 | | | | |
| LIVIA 1 | 2.16(0.60) | 33 | 2.17(0.56) | 20 | 2.01(0.66) | 16 | | | | |
| Self-concept clarity | 3.16(0.83) | 62 | 3.16(0.83) | 39 | 3.54(0.84) | 29 | *β*=.08, *t*(40.63)=.68, *p*=.50, [-.16; .32], *d*=.10 | *β*=.21, *t*(69.17)=.97, *p*=.33, [-.22; .63] | *β*=-.14, *t*(40.70)=-.81, *p*=.42, [-.49; .21] | *β*=.30, *t*(27.82)=2.66, *p*=.01, [.07; .53], *d*=.35 |
| LIVIA 2.0 | 3.27(0.94) | 29 | 3.17(0.84) | 18 | 3.50(0.84) | 13 | | | | |
| LIVIA 1 | 3.06(0.73) | 33 | 3.20(0.88) | 21 | 3.58(0.86) | 16 | | | | |
| Centrality of event | 3.72(0.95) | 62 | 3.24(1.06) | 38 | 3.13(1.15) | 29 | *β*=-.45, *t*(42.07)=-2.68, *p*=.01, [-.78; -.11], *d*=-.45 | *β*=.01, *t*(73.36)=-.02, *p*=.98, [-.51; .50] | *β*=.05, *t*(41.97)=.20, *p*=.84, [-.44; .54] | *β*=-.15, *t*(27.57)=-.97, *p*=.34, [-.47; .17], *d*=-.13 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LIVIA 2.0 | 3.72(0.82) | 29 | 3.24(0.87) | 18 | 3.26(1.06) | 13 | | | | |
| LIVIA 1 | 3.72(1.06) | 33 | 3.24(1.24) | 20 | 3.03(1.24) | 16 | | | | |
| Self-continuity | 2.66(0.88) | 62 | 2.70(0.94) | 38 | 2.92(1.04) | 29 | *β*=-.07, *t*(42.78)=-.45, *p*=.66, [-.41; .26], *d*=.08 | *β*=.20, *t*(75.86)=.89, *p*=.37, [-.25; .66] | *β*=.10, *t*(42.66)=.43, *p*=.67, [-.38; .59] | *β*=.34, *t*(28.91)=1.93, *p*=.06, [-.02; .70], *d*=.35 |
| LIVIA 2.0 | 2.77(0.76) | 29 | 2.85(0.93) | 18 | 2.97(0.99) | 13 | | | | |
| LIVIA 1 | 2.57(0.97) | 33 | 2.57(0.95) | 20 | 2.88(1.11) | 16 | | | | |

*Note*. Grief symptoms were assessed by using the Traumatic Grief Inventory; Depression symptoms were assessed by using the Patient Health Questionnaire (PHQ-9); Anxiety symptoms were assessed by using the General Anxiety Disorder-7 (GAD-7); Well-being was assessed by using the Flourishing Scale; Loneliness was assessed by using the UCLA Loneliness Scale; Identity scales used were the Self-Concept Clarity Scale, Centrality of Event Scale, and Self-Continuity items. [a] Estimates of fixed effects

### Treatment Satisfaction

Participants of the ITT sample reported overall high levels of satisfaction with the LIVIA programmes ($M$ = 3.18, $SD$ = .54, over a *max*. = 4). There were however no significant differences between arms ($t(32)$ = .33, $p$ = .75; $M_{LIVIA\ 1}$ = 3.21, $SD_{LIVIA\ 1}$ = .50, $M_{LIVIA\ 2}$ = 3.15, $SD_{LIVIA\ 2}$ = .59). Satisfaction scores across subdimensions were very similar: satisfaction with the theoretical content ($M$ = 3.55, $SD$ = .43), satisfaction with the practical content ($M$ = 3.46, $SD$ = .42), and satisfaction with the structure ($M$ = 3.48, $SD$ = .49). None of these dimensions showed significant differences between arms ($t(32) > .03 < .48$, $p > .63 < .93$). Note that we conducted analyses on the ITT sample, as they are more conservative and comprise a larger sample.

### Stability of the Effects

Table 4 contains the post-follow-up effect sizes and the means and standard deviations of all outcome measures for the treatment groups three months after the post measurement. A total of 32 participants completed the follow-up measurement (ITT analyses) and 22 were included in the PP analyses. The ITT analyses indicated that the effects were mostly stable at follow-up, except for self-concept clarity, which significantly improved at the within-group level, and loneliness and self-continuity, which showed a trend toward (further) improvement (but should be interpreted with caution given the limited sample size). The results of the PP analyses, detailed in the Supplemental Material, revealed similar results, with the exception that loneliness remained stable and self-concept clarity showed only a trend toward improvement.

## Discussion

This study aimed to compare two Web-Based Interventions (WBIs) for individuals with prolonged grief symptoms due to either death or romantic separation: LIVIA 1, an established program serving as the control condition, and LIVIA 2.0, a newly developed

programme. The present study demonstrated that both programmes were effective in reducing grief, depression symptoms as well as the centrality of the loss and to improve self-concept clarity. However, no effect was found for other outcomes. Moreover, no difference emerged between both programmes' efficacy, drop-out rates and satisfaction level.

Overall, the present study demonstrated that both programmes effectively reduced grief and depression symptoms, with large effect sizes for grief and medium effect sizes for depression symptoms. The benefits acquired during the programmes were maintained post-intervention three months later.

Beyond traditional symptom measures, the study also assessed identity-related concepts, recognizing that interpersonal loss can negatively impact self-concept and identity, which predicts prolonged grief symptoms [27, 33]. Notably, two innovative findings emerged. First, the centrality of the loss to participants' identities decreased following the programmes; second, participants' self-concept clarity improved significantly at follow-up. The centrality of the loss to one's identity is associated with prolonged grief reactions [70]. Most cognitive therapies aim to alter narrative interpretations of traumatic events [71]. The present results indicate that both interventions reduced the dominance of the loss in participants' identities and daily experiences, an effect that persisted at post-test. This was also maintained six months later, demonstrating the sustainability of the programmes' impacts. This shift occurred even in LIVIA 1, which does not explicitly focus on identity processes, highlighting the flexibility of CBT interventions in addressing complex grief reactions. These interventions may enhance coping strategies, facilitate cognitive and emotional processing, and thus contribute to the reconstruction of identity post-loss (e.g. [72]). Additionally, this suggests that the programmes might have helped participants normalize their grief and find new meanings in the loss, thereby reducing its overwhelming influence. This might have implications for the participants' ability to reinvest other aspects of life, contributing to an overall increase in resilience [73]. Given these observations, future research should explore

the potential mediating role of decreased event centrality on grief symptoms using larger samples [27, 73].

Several outcomes, including well-being, loneliness, self-concept clarity, and self-continuity, were however not significantly affected by the interventions. The programmes might have lacked specific content regarding these outcomes to produce detectable effect sizes. For instance, loneliness showed a medium effect size improvement, but was not statistically significant. Finally, self-concept clarity improved between post-test and follow-up. The interventions may have initiated a process of reflection and reevaluation that takes time to manifest in tangible improvements in self-concept clarity. Participants might have needed additional time post-intervention to internalize the changes and insights gained during the programme, leading to a clearer and more stable sense of self over time [74, 75]. However, these findings need replication given the small sample size.

There were no significant differences between LIVIA 1 and LIVIA 2.0 in outcomes or dropout rates, contrary to our hypothesis. This aligns with the generally limited differences found between various psychological interventions [76]. One possible explanation is that the innovations included in LIVIA 2.0 (i.e. the tailoring, increased interactivity and the identity-focused module – for more details, see [38].) may not have been sufficient to create a clear distinction between the programmes. Additionally, both programmes were based on similar theoretical foundations, relying on CBT and the Dual Process Model of grief [34]. Finally, the limited power prevented the detection of small effects.

One significant innovation was the use of guidance on demand. This showed limited success, as there were only very few guidance requests, most of which concerned technical issues (for details, see [38]). This might explain the much higher dropout rate compared to Brodbeck and colleagues' guided version of LIVIA 1 [18] (40% for the present project vs. 11% for theirs). However, a recent study on an unguided Internet intervention for grieving adults during the COVID-19 pandemic showed much higher dropout rates (90%; [77]). Thus,

the innovations implemented, particularly the automated e-mails and the possibility to ask for help if needed, might have boosted the retention rates, albeit to a lesser degree than weekly guidance would have. This reflects research on social support, which shows that its most beneficial aspects is its perceived availability [78].

Completers showed high satisfaction with the theoretical content, practical content, and programme structure, with no significant differences between the programmes. This further suggests that the innovations integrated into LIVIA 2.0 did not have a substantial impact. Future research should further explore the factors contributing to participant' satisfaction and retention, such as those proposed by Ritterband et al. [79] for behaviour change by WBIs. Although the differences between both programmes might be small, the study's statistical power was insufficient to detect such differences.

**Strengths and Limitations**

The present study compared two competing WBIs targeting prolonged grief symptoms after interpersonal loss, addressing a gap in comparative research on psychological interventions for grief [80]. To the best of our knowledge, this is the first study testing the efficacy of a grief web-based intervention in French. The sample exhibited a wide diversity in terms of age, gender, type of loss and employment type, effectively representing the population of people with prolonged grief symptoms. However, there was an overrepresentation of individuals with a University degree.

An important limitation of the study is its sample size. Initially, 264 participants were planned to detect small effect sizes and conduct moderation analyses, but only 27 were finally included into the per-protocol analyses, limiting the interpretability of the results as well as the risk of type II error. The small sample size was due to several factors: a) the recruitment phase was limited by new requirements for online research in Switzerland [81]; b) the eligibility criteria excluded many interested people (the most common exclusion reasons

being already undergoing a treatment, the loss having occurred less than 6 months ago, and moderate to acute suicidality, see Figure 1); c) the necessity of obtaining the original informed consent from every participant (with handwritten signature), despite the entire procedure being conducted online (see Figure 1); d) high access to psychotherapy in Switzerland (research indicates that, when given the choice, people often prefer traditional face-to-face psychotherapy [82]); and e) the relatively small French-speaking population in Switzerland, while larger populations would be needed for specific sample recruitment. The small sample size limits statistical power, allowing only the detection of medium pre-post effect sizes. Therefore, the absence of effects on certain outcomes (e.g. loneliness, well-being) and the lack of differences between the two interventions are inconclusive.

Another potential limitation is the large diversity of the participants (e.g. in terms of age, type of loss, time since the loss). Tailoring interventions to the specific needs of sub-samples might be beneficial. Developing a more sophisticated specification algorithm could improve content adjustment according to participant profiles [83], potentially incorporating a therapeutic chatbot and AI technologies [84].

As is common in e-health trials, the present study examined multiple outcomes, which increased the risk of Type I error [85]. Additionally, due to the limited sample size, we did not examined the influence of the extent to which participants used the intervention. Finally, the somewhat complex informed consent process requiring a hand-written signature might have discouraged some people from participating, potentially biasing the sample selection.

**Clinical Implications**

The results and observations from the present study might provide valuable insights for clinical application. First, given the high attrition rate during the recruitment process (only 27% of interested individuals were randomized), it is likely that recruitment could improve in a more naturalistic setting. Second, offering the programme in a blended therapy setting, as

commonly practiced in clinical environments [8], would allow customisation of the timing of the content proposed by the LIVIA programmes.

### Research Perspectives

In response to the high dropout rate, we are conducting interviews with participants who discontinued the programme to understand their motives and derive strategies for better retention. Additionally, a detailed analysis of browsing behaviours would enable to understand how the programme is used. This would provide reliable objective secondary data, allowing for example for improvements in (differential) indication. To obtain more conclusive results, it is essential to gather a larger sample by recruiting participants from other French-speaking European countries. While technological advancements facilitate this process, heterogeneous regulations can complicate it [86]. Finally, regarding a better tailoring of the intervention, adopting a co-design approach [87] could be beneficial. This could involve organizing focus groups with the target population and conducting interviews with key stakeholders, such as grief therapists.

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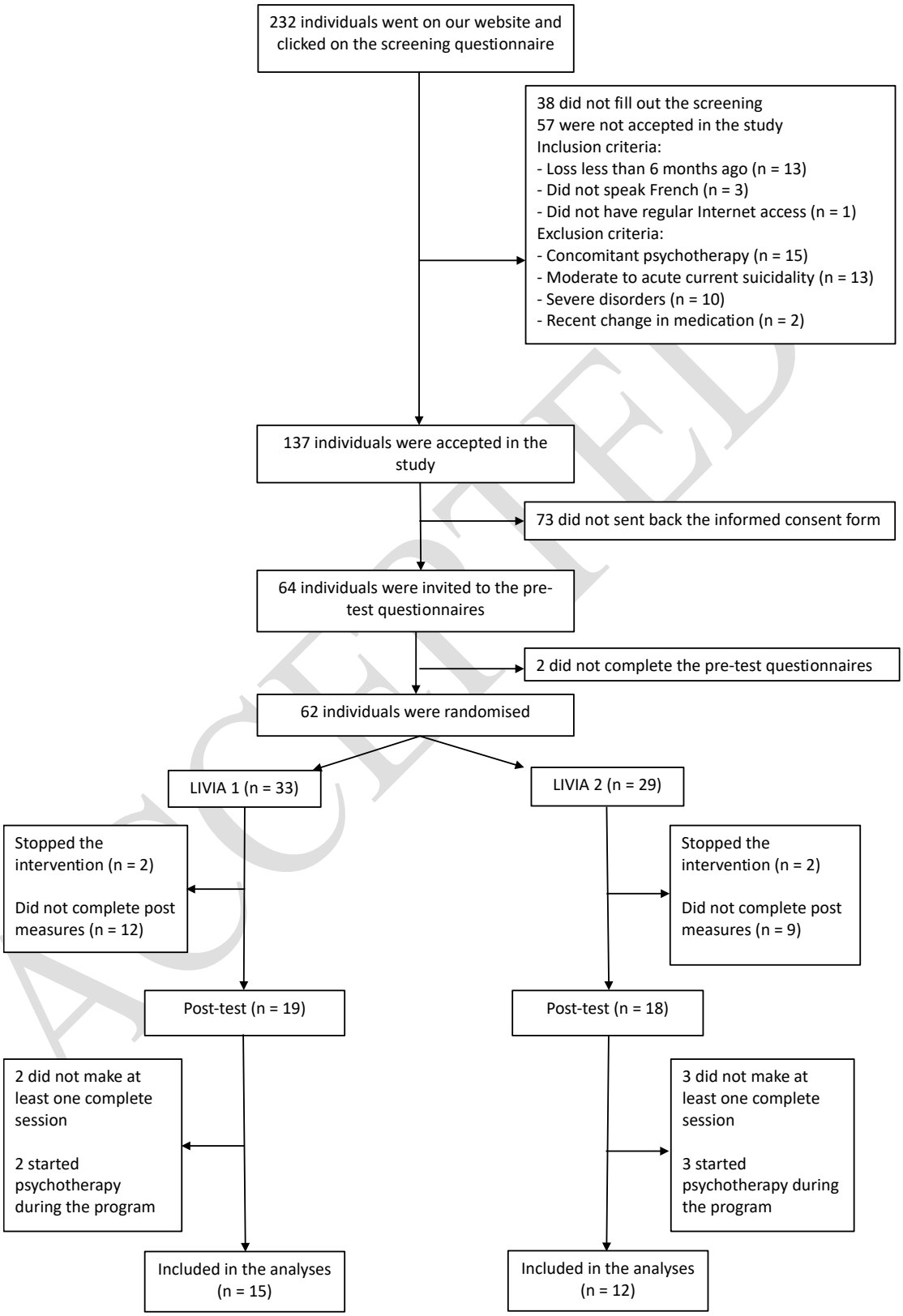
### Data availability statement

The data set generated and analyzed during this study is available in the SWISSUbase repository under this link: https://doi.org/10.48573/6yqx-1k59.

**Figure 1:** Study design flow chart. LIVIA 2.0: active arm, LIVIA 1: control arm.



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