User-centered development of an internet-based CBT intervention for the treatment of loneliness in older individuals

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ABSTRACT

Background: Loneliness is a widespread phenomenon associated with a number of negative health outcomes. Older individuals may constitute one important target group with a need for effective interventions. However, despite evidence showing that addressing maladaptive social cognition (e.g., via cognitive behavioral therapy [CBT]) is the most effective intervention strategy for reducing loneliness, most existing programs aimed at older individuals do not use that method. Further, in terms of mental health service use, older individuals have been found to be an extremely undertreated population. When developing interventions, active involvement of end users in the development process is essential to increase later uptake.
Objective: The aim of the present study was to develop an internet-based CBT intervention for loneliness in older individuals (i.e., aged ≥65 years) applying a user-centered design. The present report provides an in-depth description of the development process.
Methods: Two phases of qualitative data collection were conducted in parallel with intervention development using a sample of $N = 12$ participants including both potential end users (i.e., older adults) as well as experts (i.e., psychotherapists). Measures included semi-structured interviews and usability testing.
Results: In Phase 1 interviews, participants indicated that they were predominantly positive about the idea of an internet-based program for loneliness targeting older individuals. Individualization and interactivity were named as crucial features. In Phase 2, usability testing of a prototype program provided important insights into technical barriers to intervention use. Further, participants reported that they were missing content on philosophy/theology and the role of descendants/relatives. Valuable insights from Phase 1 and Phase 2 were incorporated into the intervention program resulting in a 7-module internet-based self-help CBT intervention.
Discussion: Findings of this study highlight the significance of including relevant stakeholders in the development process of an intervention. Additionally, results emphasize the high acceptance of internet-based interventions in this population, but also underline the need for considering age-specific aspects when developing treatments.

1. Introduction

Loneliness is a widespread phenomenon and has been described as a serious public health issue (e.g., Holt-Lunstad et al., 2017). In the literature, it is usually defined as a perceived discrepancy between an individual's desired and actual social network (Peplau and Perlman, 1982). Indeed, feelings of loneliness have been found to be related to a broad range of both physical and mental health conditions (Hawkley and Capitanio, 2015). In line with that, researchers have also emphasized the high health care costs associated with loneliness (Meisters et al., 2021).

A recent study investigated the age distribution of loneliness feelings across the adult lifespan (Hawkley et al., 2022). Findings pointed at a non-linear shape with increased loneliness levels among those at younger (< 30 years) and older age (>70 years) with an additional peak found in adults aged around 50–60 years. Interestingly, no significant association was found between loneliness and age when controlling for a number of relevant covariates. However, the authors concluded that

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predictive factors for loneliness, such as low income, worse health, widowhood, and low social contact frequency are more common in older age and thus may account for the observed differences in the age distribution of loneliness. Based on these findings, older adults may constitute one important target group with a need for effective loneliness interventions.

Given the negative effects of loneliness on both the individual and societal level, there is an increasing interest in finding effective intervention strategies to decrease feelings of loneliness. In 2011, Masi and colleagues published a meta-analysis on the efficacy of different types of loneliness interventions (Masi et al., 2011). Based on the literature, the authors were able to identify four main intervention strategies that were used to reduce loneliness, namely a) improving social skills, b) enhancing social support, c) providing opportunities for social contact, and d) addressing maladaptive cognitions (e.g., via cognitive behavioral therapy [CBT]). Interestingly, interventions using the latter strategy were found to be most effective. The authors concluded that this result is in line with the model of loneliness as a regulatory loop according to which lonely individuals show an increased vigilance for social threats, remember more negative social information, and tend to engage in social behavior that confirms their negative expectations (Cacioppo and Hawkley, 2009). However, despite these findings, most loneliness interventions targeting older individuals have been found to not focus on maladaptive cognitions, but rather use other strategies (e.g., social contact) (O'Rourke et al., 2018).

When it comes to the treatment of mental health conditions in the elderly, older adults have been found to be an extremely underserved population. Indeed, in a study by Trollor et al. (2007), only a quarter of older individuals experiencing a mental disorder within the last year had sought treatment. Lack of perceived need as well as transportation and mobility limitations have been identified as potential factors impeding the provision of mental health services to this age group (Knaevelsrud et al., 2017; Mackenzie et al., 2010). Hence, innovative intervention approaches are needed in order to circumvent these barriers and narrow the existing treatment gap among this population (Dworschak et al., 2022).

Internet-based interventions provide an alternative treatment approach and have been found to overcome a number of barriers associated with face-to-face treatments, such as geographic boundaries (Knaevelsrud et al., 2017) and stigma (e.g., Cuijpers et al., 2008). Additionally, this type of intervention has been argued to alleviate social anxiety associated with seeing a therapist (Soucy and Hadjistavropoulos, 2017), which has been suggested as particularly beneficial in the context of loneliness given the high degree of withdrawal and avoidance shown in lonely individuals (Käll et al., 2020). Importantly, internet-based interventions have been found to be an effective treatment option across the adult life span, including older individuals (Andersson et al., 2019; Dworschak et al., 2022).

A major challenge in internet-based treatments is the low uptake rate by users (e.g., Eysenbach, 2005). A low level of user engagement in the development phase of interventions has been described as one of the major causes for uptake issues (Gemert-Pijnen et al., 2011). One promising method to address this problem is the active involvement of potential end users in the development process of an intervention (de Beurs et al., 2017). A main element in these approaches is to assess users' needs and use this knowledge as a basis for intervention conceptualization (e.g., Bartholomew et al., 1998). Generally, in intervention research, a detailed description of *how* interventions are developed has also been mentioned as a crucial step to enable continuous improvement and dissemination of such programs (e.g., Schueller et al., 2017).

The aim of the present study was to develop an internet-based CBT intervention for loneliness in older individuals (i.e., aged ≥65 years) involving potential end users and experts during two phases of data collection via a user-centered design (UCD). Importantly, given the above-mentioned findings, we aimed to develop an intervention that specifically focused on addressing maladaptive social cognition as the main intervention strategy (vs. other strategies). To the best of our knowledge, there exists no such intervention exclusively targeting older individuals. The aim of the current report is to provide an in-depth description of the development process of the intervention.

2. Methods

2.1. Study design

We used a UCD to develop the intervention. UCD describes the active involvement of potential end users in the development process of an intervention (de Beurs et al., 2017). Within this method, we implemented a qualitative descriptive design, which aims for a comprehensive yet simple description of the thoughts and insights provided by participants (Bradshaw et al., 2017; Sandelowski, 2000). Two phases of qualitative data collection with potential end users (PEU) and experts (E) were conducted in parallel with the development of our intervention. The aim of the first phase was to identify the needs and preferences of potential end users; findings were then incorporated into the development of a prototype. As soon as a prototype intervention was available, the second phase of data collection was conducted, which aimed at testing the prototype and receiving feedback on this first version. Findings from the second phase were then used to modify the prototype and develop the final intervention. Fig. 1 describes the study design in detail. In the following, the methods used in each phase of data collection are outlined. After that, the results section will cover findings of both phases of data collection as well as insights into the development of the prototype and the final version of the intervention program.

2.2. Phase 1 – needs and preference assessment

2.2.1. Participants

Following recommendations of Boddy (2016) on appropriate sample sizes in qualitative designs, we aimed for a number of 12 participants taking part in both phases of data collection. The sample was composed of two subgroups, potential end users (i.e., adults aged ≥65 years), and experts (i.e., psychotherapists that had treated at least eight patients aged ≥65 years). Additionally, all individuals had to be fluent in German. With regard to potential end users, we decided to not recruit lonely individuals specifically, but rather older individuals in general given the widespread and not per se pathological nature of loneliness. We aimed for a higher number of potential end users as participants than experts. Potential end users were recruited via flyers, online advertisements, and the Senior Citizen's University in Zurich. Experts were contacted individually by searching for mental health services in the Zurich area that offered psychotherapy specifically for older adults. Participants received a voucher of 50 CHF for their participation in both phases.

The final sample consisted of 12 participants including eight potential end users and four experts. One of the experts was not a psychotherapist by training, but a pastor. However, given his years of
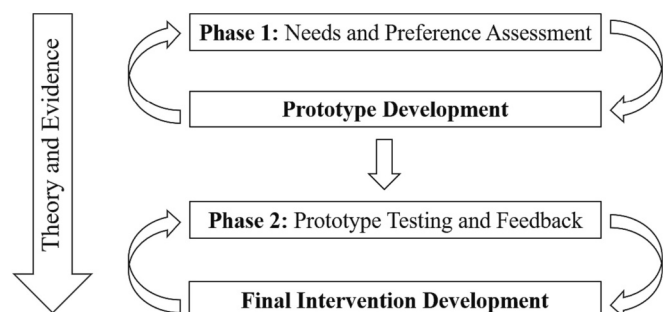

Fig. 1. Study design.

experience in the work with older adults (including counselling work), we decided to include him as an expert. Table 1 presents participants' demographic characteristics.

2.2.2. Procedure

Data collection took place between December 2021 and February 2022. Interviews were conducted either at the University of Zurich, at the participant's home or via an online video conference tool depending on the participant's preference. At the beginning of the session, participants gave their consent and filled out a demographic questionnaire. Additionally, potential end users were asked to report on their internet use. After that, a semi-structured interview was conducted. The same two interviewers were running the sessions, with one interviewer present per session. All interviews were audio-recorded with permission. On average, interviews lasted for $M = 37.00$ min ($SD = 10.72$).

2.2.3. Measures

For the most part, all measures were the same for both subgroups of participants; any minor difference is noted in the respective section. However, the main difference was that while potential end users were instructed to consider themselves as a representative of the older adult group and respond from that perspective, experts were instructed to respond from the background of their knowledge and experience with the target group.

2.2.3.1. Internet use. To assess potential end users' internet use we used two questions from Kortmann et al. (2021). The first questions focused on whether participants had access to the internet (response options: *yes, privately*; *yes, professionally*; *no*). The second question asked about the frequency of internet use for seven different purposes (e.g., shopping) using a response scale ranging from (1) *never* to (6) *daily*.

2.2.3.2. Semi-structured interview. A semi-structured interview was used to identify potential end users' needs and preferences. Both subgroups were basically asked the same questions; except for two questions that

Table 1
Demographic characteristics.

Subgroup	Demographic Details	N (%)	M (SD)
Potential end users ($n = 8$)	Female	3 (37.50)	
	Age		75.75 (8.66)
	Nationality		
	Swiss	6 (75.00)	
	Dual citizenship (Swiss and other)	2 (25.00)	
	Marital status		
	Single	1 (12.50)	
	Married	4 (50.00)	
	Divorced	2 (25.00)	
	Widowed	1 (12.50)	
	Number of Children		2.13 (1.96)
	Highest Education		
	Apprenticeship / vocational training	5 (62.50)	
	High school diploma / Matura	1 (12.50)	
	University	2 (25.00)	
	Current Professional Situation		
	Retired	8 (100.00)	
Experts ($n = 4$)	Female	3 (75.00)	
	Age		58.00 (2.20)
	Years of experience		25.75 (4.79)
	Percentage of patients 65+		76.77 (15.28)

Note. Characteristics of the sample at Phase 1.

were specific to potential end users. The interview covered four main topics: (1) loneliness (e.g., definition, relevance), (2) mental health and service use (e.g., relevance, barriers, facilitators), (3) internet use (e.g., relevance, barriers, facilitators), and (4) internet-based loneliness intervention (e.g., potential barriers and facilitators, important content and features).

2.2.4. Data analysis

Audio recordings of interviews were transcribed. Data was then analyzed using Thematic Analysis (Braun and Clarke, 2006), applying both an inductive and a deductive approach (e.g., Azungah, 2018). Two coders and one "judge" solving any disagreements between coders were involved in the coding process. Subgroup analyses were conducted to identify any systematic differences between potential end users and experts; in the results table it is noted if a theme was mentioned by one subgroup only.

2.3. Phase 2 – prototype testing and feedback

2.3.1. Participants

The same participants as in Phase 1 took part in Phase 2. Only one of the experts who participated in Phase 1 was not able to take part in the second phase and was therefore replaced by a new participant.

2.3.2. Procedure

As soon as a prototype version of the intervention was available, Phase 2 started (the prototype is described in the results section). Data collection took place in June 2022. Due to the technical set-up, testing sessions had to be conducted either at the University of Zurich or at the participant's home. The session was split into two parts. In the first part of the session, a *Think aloud walkthrough* was conducted, and notes were taken by the respective interviewer. The second part of the session involved a semi-structured interview. The same two interviewers as in Phase 1 were running the sessions, with one interviewer present per session. Additionally, a third interviewer undertook two sessions. The entire session (both parts) was audio-recorded with permission. The average duration of the sessions was $M = 94.25$ min ($SD = 20.21$).

2.3.3. Measures

2.3.3.1. Think aloud walkthrough. To gain information on the usability, content and design of the prototype intervention, participants were asked to perform some standardized "think aloud" (Nielsen, 1993) and "cognitive walkthrough" (Lewis and Wharton, 1997) tasks (referred to as *Think aloud walkthrough*). As part of these methods, participants are asked to engage in specific activities (e.g., using a program) and verbalize any thought that comes to their mind. By using these approaches, researchers can easily identify any features that hinder the intuitive use of the system as well as gain information on how participants like or dislike specific aspects of a program (Burchert et al., 2019). The *Think aloud walkthrough* was conducted in three steps with breaks in between. In the first step, participants were asked to perform a few basic critical tasks of the intervention on a laptop (e.g., login). As part of the second step, participants were asked to use the intervention independently on a laptop for a maximum of one hour. They were instructed to get an overview of the program, test the functionalities, and take a look at each module. Every 15 min, participants were informed about the time passed. This task was stopped when either a) the entire program had been completed, b) one hour had passed or c) the participant wanted to stop the task. In the third part, participants were asked to briefly test the intervention on a smartphone and on a tablet (total duration of 10 min). In each of these steps, individuals were instructed to verbalize their thoughts and were reminded to do so, if they forgot. During the entire *Think aloud walkthrough* the respective interviewer took notes and observed the participant.

2.3.3.2. Semi-structured interview. To gain feedback on specific aspects of the intervention, a semi-structured interview was conducted. The interview covered three main topics: (1) general impression of the intervention (e.g., overall opinion, greatest challenge, potential barriers, relevance, usefulness), (2) content (e.g., useful/useless topics, missing topics, suggestions), and (3) design and illustrations (e.g., aspects they liked/disliked, missing aspects, suggestions).

2.3.4. Data analysis

Audio recordings were transcribed as a first step, except for the *Think aloud walkthrough*. For the latter, the notes taken by the interviewer were used since the recording only served as a quality backup. Data was then analyzed using Thematic Analysis (Braun and Clarke, 2006), applying both an inductive and a deductive approach (e.g., Azungah, 2018). Data from both parts of the session were combined. The aim of data analysis was to develop a feasible list of suggestions in order to modify the prototype. Two coders and one "judge" solving any disagreements between coders were involved in the coding process. Subgroup analyses were conducted to identify any systematic differences between potential end users and experts; in the results table it is noted if a theme was mentioned by one subgroup only.

3. Results

3.1. Phase 1 – needs and preference assessment

Regarding potential end users' internet use, results showed that seven individuals had access to the internet privately. All seven participants used the internet at least for communication and information seeking purposes. Overall, potential end users most frequently used the internet for (1) communication, (2) searching for information, and (3) entertainment and culture (for full results, see Table S1).

Phase 1 interviews provided important insights regarding potential users' needs and preferences (see Table S2). Participants described loneliness as a highly stigmatized topic and defined it as "social isolation" or "being alone":

"Well, that are people who have little or no social contacts."

(P07, male, 82, PEU)

With regard to mental health, lack of knowledge, a perceived age difference between patient and therapist, and stigmatization were indicated as potential barriers to mental health service use, while medical doctors were identified as potential facilitators. The general attitude towards the internet was predominantly positive; however, lack of support and knowledge were mentioned as important barriers. Overall, participants were very positive about the idea of an internet-based loneliness intervention for older adults and described the low-threshold and easily accessible character of the program as particularly beneficial:

"It's maybe also an intermediate step to a psychologist, right? (…) And maybe you can find solutions directly in this program"

(P03, male, 67, PEU)

"Especially today, when we have so little contact to people it's – and when people are home alone so often – to just be able to open the laptop and then I click here and ask there (…)"

(P02, male, 77, PEU)

Individualization (i.e., providing options to make the program suit one's individual needs) and interactivity (e.g., interactive exercises) were mentioned as crucial features of such an intervention.

3.2. Prototype development

The prototype intervention was developed based on both existing literature and results from Phase 1 interviews. In line with the literature

on loneliness (e.g., Masi et al., 2011), CBT was chosen as the main therapeutic approach with a particular focus on cognitive restructuring. The method of cognitive restructuring was introduced in Module 2 including explanations and exercises on (a) how to identify maladaptive cognitions in a first step and (b) challenge and substitute them using various strategies and techniques in a second step (e.g., evidence gathering). Cognitive restructuring was then applied to various cognitions specifically relevant in the context of loneliness across modules, such as challenging negative evaluations of being alone (module on conscious aloneness) or questioning one's own expectations from others, as well as reflecting on the impact of expectations on relationship satisfaction (integrated into the module on social relations). Additionally, since loneliness is robustly associated with reduced general well-being (e.g., Windle and Woods, 2004) as well as depression (e.g., Erzen and Çikrikci, 2018), some elements specifically addressing these "comorbid" aspects were incorporated. To this aim, we also included techniques from other psychological approaches, that have been shown to be particularly useful and effective for addressing these aspects in older adults, such as positive psychology (for improvement of well-being in older age; e.g., Carr et al., 2021) or life-review therapy (for improvement of depressive symptoms in later life; e.g., Forstmeier et al., 2023; Pinquart and Forstmeier, 2012). Actions implemented based on results from Phase 1 interviews can be seen in Table S2. This process resulted in an internet-based intervention consisting of seven modules. Each module focused on a different topic (for an overview, see Table 2) and consisted of texts, pictures and audio recordings and included both explanations as well as practical exercises. A fictional e-coach guided users through the intervention. Additionally, the program included six fictional characters

Table 2
Prototype intervention modules and additions in the final version of the intervention.

Prototype			Final version
Module	Topic	Content	Content-wise additions
1	Welcome	• Program introduction and outlook • Introduction of e-coach and fictional characters • Motivation and goal-setting	• Introduction of the metaphor of a "mountain hike" to describe how to work with the program
2	Loneliness and negative thoughts	• Definition of loneliness • Development of loneliness • Introduction of the thought-feelings-actions triangle model	• Film clip on the experience of loneliness
3	Conscious aloneness	• Difference between aloneness vs. loneliness • Conscious aloneness	
4	Social relations	• Reflection on one's own social relations • Social fears • Expectations in social relations	• Particular focus on relations with descendants/relatives
5	Wellbeing	• Rumination • Sleep hygiene • Routines and day structure	• Particular focus on self-care • Film clip on self-care
6	Losses	• Grief after a loss • Fear of loss	• Film clip on the experience of loss
7	Closure	• Reflection and review of the program • Preserving achievements • Further resources	• Topic "meaning of life"

sharing their personal experiences with loneliness. These characters were of varying age (but all ≥65 years) and gender and faced different life circumstances. The intervention was designed as a self-guided self-help intervention; no therapist support (i.e., guidance) was integrated. This decision was made given the project's aim of developing (and testing in future studies) an intervention specifically focusing on maladaptive social cognitions as the main treatment strategy and being able to disentangle effects due to CBT techniques from those of guidance that may be particularly relevant in the context of loneliness (e.g., effects associated with the formation of a trusting relationship with the therapist) (Käll et al., 2020).

3.3. Phase 2 - prototype testing and feedback

Results of Phase 2 interviews and prototype testing are shown in Table S3. As some emerging themes were contradictory, we decided to only consider themes that were mentioned by at least three potential end users or two experts. In general, participants particularly liked the design and illustrations as well as the language used:

"(…) it is very well designed and really nicely done. It has nice pictures, which go very well with the modules. Color-wise it is beautifully made (…) I am surprised, the result is really a very beautiful program."

(P5, female, 65, PEU)

"The texts (…) were well drafted, they are understandable, it is not a scientific wording."

(P10, male, 85, PEU)

With regard to the content, they described the intervention as comprehensive and highly acceptable:

"They [the program's topics and content] are good. They are very good, they are very diverse, they cover many areas of psychotherapy itself, don't they? Very complete. Yes. It's really very good content-wise."

Some participants were missing input on philosophy/theology as well as on the role of descendants and relatives. Both potential end users and experts appreciated the intuitive use of the intervention, but had difficulties with some specific buttons (e.g., "next" button). Indeed, some of the technical difficulties we observed seemed to be rather related to the general use of a website or a laptop than specific to our intervention program.

3.4. Final intervention development

Results of Phase 2 interviews provided a feasible list of suggestions, that was then used to modify the prototype and develop the final intervention. The monitoring sheet developed by Shala et al. (2020) was used in a modified form in order to guide the adaptation and decision-making process and to transparently document the procedure. As part of this sheet, for each negative aspect or suggestion raised by the participants, the strength of the evidence was evaluated (derived from the number of participants mentioning it) and two team members independently made suggestions on how to adapt the prototype. We adapted the monitoring sheet of Shala et al. (2020) by (1) renaming the column "quality of evidence" "strength of evidence", (2) adding a separate column collecting and evaluating the strength of evidence from the literature in favor and/or against participants' suggestions (filled out individually by team members; strength of evidence was derived from the number and consistency of findings) as well as (3) adding another separate column evaluating the technical feasibility of the suggestion. Team members then met periodically and discussed suggestions. Final decisions regarding adaptations were made in team discussions based on both opinions of participants as well as research evidence. Generally, while we gave more weight to participants' feedback when deciding on

surface adaptations (e.g., design, technical usability), we gave more weight to research evidence when discussing content-wise adaptations. A third team member took on the role of a "judge" to resolve any potential disagreements. An excerpt of the monitoring sheet can be found in the supplementary material (see Table S4).

A number of adaptations were made. With regard to technical aspects, main adaptations included the addition of a "restart module" button on every page and the enlargement of the "logout" button. The number and length of texts was reduced and some texts were converted into audio recordings. Additionally, within longer paragraphs of written texts, several words were marked in bold to facilitate reading. As participants suggested adding motivational input, weekly emails were installed (sent in the name of the e-coach) and motivational messages were added at the end of extensive modules. Additionally, short film clips were incorporated in order to make the program more entertaining and illustrate the content. Furthermore, as the fictional characters included were perceived very positively, we increased their appearance within the modules to provide examples. The feedback on the original voice of the fictional e-coach used within audio recordings was predominantly negative; we therefore re-recorded the audios with a new voice. As we observed several challenges and problems with regard to the rather general use of a website, we decided to add some form of technical support to the intervention (i.e., we provided a phone number and email address for technical support). Content-wise adjustments and additions to the final version of the program are presented in Table 2.

4. Discussion

The aim of this study was to describe the user-centered development of an internet-based CBT intervention for loneliness in older adults. To the best of our knowledge, there exists no such intervention exclusively targeting older individuals. Two phases of data collection were conducted, including semi-structured interviews and a usability testing, which resulted in valuable insights regarding the needs and preferences of the target group as well as barriers and facilitators to intervention use. A main strength of this study is the continuous and iterative improvement of the program and its features as well as the extensive involvement of relevant stakeholders in the development process.

4.1. Summary of findings

Phase 1 interviews provided a number of important insights, two of which should be highlighted here. First, participants were predominantly very positive about the idea of an internet-based self-help program for loneliness and named the low-threshold and easily accessible character of the intervention as particularly beneficial. Although older adults are still underrepresented in research on internet-based interventions (Crabb et al., 2012), this treatment approach has been found to be acceptable (e.g., Mewton et al., 2013) and effective in this population (Dworschak et al., 2022). Our findings are in line with this evidence and emphasize the need to develop more such interventions for this age group.

Further, participants highlighted the importance of individualization within such a program. This is consistent with the literature describing tailoring as one factor (among others) mediating effects of internet-based treatments (Morrison et al., 2012) as well as with studies showing that individualization within an intervention may enhance engagement and adherence (e.g., Schubart et al., 2011). Thus, although we were limited in our possibilities to provide a fully tailored program, we still tried to include some features for individualization, such as making all modules accessible right from the beginning, enabling participants to skip subtopics, and allowing users to choose one out of six fictional characters.

With regard to results of Phase 2, the usability testing of the prototype provided some crucial insights into technical barriers to the use of our program. Although some of these issues could be adjusted in the

final version, a number of problems that occurred were rather associated with participants' lack of knowledge on the general use of a website. This emphasized the need for us to provide at least some technical support during intervention use (e.g., via phone/email address that can be contacted in case of technical issues) and has also been recommended in the literature on internet-based interventions for older populations (e.g., Crabb et al., 2012).

Interestingly, in Phase 2, experts also mentioned that they were missing some philosophical or theological content in the prototype. Indeed, the relevance of "finding meaning" has been highlighted as a crucial goal (Grosse-Holtforth and Grawe, 2000) as well as developmental task in higher age (Erikson, 1982). Also, "finding meaning" is a central element in life-review therapy, a treatment approach specifically aimed at older individuals (e.g., Butler, 1963). There is also evidence for "meaning-oriented" interventions showing robust beneficial effects (Vos et al., 2015). Taken together, these findings emphasize the need for adapting interventions to specific age groups and consider age-specific developmental aspects when designing interventions, as has also been suggested by other researchers (Laidlaw and Kishita, 2015).

4.2. Limitations

Results of the current study have to be considered in light of several limitations. First, potential end users were not included based on their experience of loneliness. Thus, insights provided by these participants may not correspond to those of actual end users. Second, all participants included as potential end users were German-speaking and swiss. Hence, we may have missed important insights of particularly vulnerable individuals (e.g., migrants). Third, there was a high probability of self-selection bias in our sample, which may have resulted in only highly motivated individuals participating, curtailing the validity of our results.

4.3. Conclusion

The aim of the current study was to provide an in-depth description of the user-centered development of an internet-based CBT intervention for loneliness in older individuals. To the best of our knowledge, this intervention is the first of its kind. Results of the two phases of qualitative data collection provided crucial insights regarding the needs and preferences of potential end users, usability of the program, as well as barriers and facilitators to actual intervention use, which were then implemented into the program. Findings of the present study underline the significance of involving relevant stakeholders in the development process of an intervention.

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Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.invent.2024.100720.

References

Andersson, G., Carlbring, P., Titov, N., Lindefors, N., 2019. Internet interventions for adults with anxiety and mood disorders: a narrative umbrella review of recent meta-analyses. Can. J. Psychiatry. 64 (7), 465–470. https://doi.org/10.1177/0706743719839381.

Azungah, T., 2018. Qualitative research: deductive and inductive approaches to data analysis. Qual. Res. J. 18 (4), 383–400. https://doi.org/10.1108/QRJ-D-18-00035.

Bartholomew, L.K., Parcel, G.S., Kok, G., 1998. Intervention mapping: a process for developing theory and evidence-based health education programs. Health Educ. Behav. 25 (5), 545–563. https://doi.org/10.1177/109019819802500502.

de Beurs, D., van Bruinessen, I., Noordman, J., Friele, R., van Dulmen, S., 2017. Active involvement of end users when developing web-based mental health interventions. Front. Psychiatry 8, Article 72. https://doi.org/10.3389/fpsyt.2017.00072.

Boddy, C.R., 2016. Sample size for qualitative research. Qual. Mark. Res. Int. J. 19 (4), 426–432. https://doi.org/10.1108/QMR-06-2016-0053.

Bradshaw, C., Atkinson, S., Doody, O., 2017. Employing a qualitative description approach in health care research. Glob. Qual. Nurs. Res. 4, 1–8. https://doi.org/10.1177/2333393617742282.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101. https://doi.org/10.1191/1478088706qp063oa.

Burchert, S., Alkneme, M.S., Bird, M., Carswell, K., Cuijpers, P., Hansen, P., Heim, E., Harper Shehadeh, M., Sijbrandij, M., van't Hof, E., & Knaevelsrud, C., 2019. User-centered app adaptation of a low-intensity E-mental health intervention for Syrian refugees. Front. Psychiatry 9, Article 663. https://doi.org/10.3389/fpsyt.2018.00663.

Butler, R.N., 1963. The life review: an interpretation of reminiscence in the aged. Psychiatry 26, 65–76. https://doi.org/10.1080/00332747.1963.11023339.

Cacioppo, J.T., Hawkley, L.C., 2009. Perceived social isolation and cognition. Trends Cogn. Sci. 13 (10), 447–454. https://doi.org/10.1016/j.tics.2009.06.005.

Carr, A., Cullen, K., Keeney, C., Canning, C., Mooney, O., Chinseallaigh, E., O'Dowd, A., 2021. Effectiveness of positive psychology interventions: a systematic review and meta-analysis. J. Posit. Psychol. 16 (6), 749–769. https://doi.org/10.1080/17439760.2020.1818807.

Crabb, R.M., Cavanagh, K., Proudfoot, J., Learmonth, D., Rafie, S., Weingardt, K.R., 2012. Is computerized cognitive-behavioural therapy a treatment option for depression in late-life? A systematic review. Br. J. Clin. Psychol. 51 (4), 459–464. https://doi.org/10.1111/j.2044-8260.2012.02038.x.

Cuijpers, P., Van Straten, A., Andersson, G., 2008. Internet-administered cognitive behavior therapy for health problems: a systematic review. J. Behav. Med. 31 (2), 169–177. https://doi.org/10.1007/s10865-007-9144-1.

Dworschak, C., Heim, E., Maercker, A., 2022. Efficacy of internet-based interventions for common mental disorder symptoms and psychosocial problems in older adults: a systematic review and Meta-analysis. Internet Interv. 27, Article 100498 https://doi.org/10.1016/j.invent.2022.100498.

Erikson, E.H. (Ed.), 1982. The Life Cycle Completed. Norton.

Erzen, E., Çikrikci, Ö., 2018. The effect of loneliness on depression: a meta-analysis. Int. J. Soc. Psychiatry 64 (5), 427–435. https://doi.org/10.1177/0020764018776349.

Eysenbach, G., 2005. The law of attrition. J. Med. Internet Res. 7(1), Article e402 https://doi.org/10.2196/jmir.7.1.e11.

Forstmeier, S., Zimmermann, S., van der Hal, E., Auerbach, M., Kleinke, K., Maercker, A., Brom, D., 2023. Effect of life review therapy for holocaust survivors: a randomized controlled trial. J. Trauma. Stress. 36 (3), 628–641. https://doi.org/10.1002/jts.22933.

Gemert-Pijnen, J.E. van, Nijland, N., Limburg, M. van, Ossebaard, H.C., Kelders, S.M., Eysenbach, G., Seydel, E.R., 2011. A holistic framework to improve the uptake and impact of eHealth technologies. J. Med. Internet Res. 13(4), Article e1672 https://doi.org/10.2196/jmir.1672.

Grosse-Holtforth, M., Grawe, K., 2000. Fragebogen zur Analyse Motivationaler Schemata (FAMOS). Z. Klin. Psychol. Psychother. 29 (3), 170–179.

Hawkley, L.C., Capitanio, J.P., 2015. Perceived social isolation, evolutionary fitness and health outcomes: a lifespan approach. Philos. Trans. R. Soc. B 370, Article 20140114. https://doi.org/10.1098/rstb.2014.0114.

Hawkley, L.C., Buecker, S., Kaiser, T., Luhmann, M., 2022. Loneliness from young adulthood to old age: explaining age differences in loneliness. Int. J. Behav. Dev. 46 (1), 39–49. https://doi.org/10.1177/0165025420971048.

Holt-Lunstad, J., Robles, T.F., Sbarra, D.A., 2017. Advancing social connection as a public health priority in the United States. Am. Psychol. 72 (6), 517–530. https://doi.org/10.1037/amp0000103.

Käll, A., Jägholm, S., Hesser, H., Andersson, F., Mathaldi, A., Norkvist, B.T., Shafran, R., Andersson, G., 2020. Internet-based cognitive behavior therapy for loneliness: a pilot randomized controlled trial. Behav. Ther. 51 (1), 54–68. https://doi.org/10.1016/j.beth.2019.05.001.

Knaevelsrud, C., Böttche, M., Pietrzak, R.H., Freyberger, H.J., Kuwert, P., 2017. Efficacy and feasibility of a therapist-guided internet-based intervention for older persons with childhood traumatization: a randomized controlled trial. Am. J. Geriatr. Psychiatry 25 (8), 878–888. https://doi.org/10.1016/j.jagp.2017.02.024.

Kortmann, L., Hagen, C., Endter, C., Riesch, J., Tesch-Römer, C., 2021. Internetnutzung von Menschen in der zweiten Lebenshälfte während der Corona-Pandemie: Soziale Ungleichheiten bleiben bestehen (dza-aktuell: Deutscher Alterssurvey, 05/2021). Deutsches Zentrum für Altersfragen. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-72025-4.

Laidlaw, K., Kishita, N., 2015. Age-appropriate augmented cognitive behavior therapy to enhance treatment outcome for late-life depression and anxiety disorders. GeroPsych 28 (2), 57–66. https://doi.org/10.1024/1662-9647/a000128.

Lewis, C., Wharton, C., 1997. Cognitive walkthroughs. In: Helander, M. (Ed.), Handbook of Human-computer Interaction. Elsevier, pp. 717–732.

Mackenzie, C.S., Pagura, J., Sareen, J., 2010. Correlates of perceived need for and use of mental health services by older adults in the collaborative psychiatric epidemiology surveys. Am. J. Geriatr. Psychiatry 18 (12), 1103–1115. https://doi.org/10.1097/JGP.0b013e3181dd1c06.

Masi, C.M., Chen, H.-Y., Hawkley, L.C., Cacioppo, J.T., 2011. A meta-analysis of interventions to reduce loneliness. Personal. Soc. Psychol. Rev. 15 (3), 219–266. https://doi.org/10.1177/1088868310377394.

Meisters, R., Westra, D., Putrik, P., Bosma, H., Ruwaard, D., Jansen, M., 2021. Does loneliness have a cost? A population-wide study of the association between loneliness and healthcare expenditure. Int. J. Public Health 66, Article 581286. https://doi.org/10.3389/ijph.2021.581286.

Mewton, L., Sachdev, P.S., Andrews, G., 2013. A naturalistic study of the acceptability and effectiveness of internet-delivered cognitive behavioural therapy for psychiatric disorders in older Australians. PLoS One 8(8), Article e71825. https://doi.org/10.1371/journal.pone.0071825.

Morrison, L.G., Yardley, L., Powell, J., Michie, S., 2012. What design features are used in effective e-health interventions? A review using techniques from critical interpretive synthesis. Telemed. E-Health 18 (2), 137–144. https://doi.org/10.1089/tmj.2011.0062.

Nielsen, J., 1993. Usability Engineering. Academic Press.

O'Rourke, H.M., Collins, L., Sidani, S., 2018. Interventions to address social connectedness and loneliness for older adults: a scoping review. BMC Geriatr. 18 (1), 214. https://doi.org/10.1186/s12877-018-0897-x.

Peplau, L.A., Perlman, D. (Eds.), 1982. Loneliness: A Sourcebook of Current Research and Therapy. Wiley.

Pinquart, M., Forstmeier, S., 2012. Effects of reminiscence interventions on psychosocial outcomes: a meta-analysis. Aging Ment. Health 16 (5), 541–558. https://doi.org/10.1080/13607863.2011.651434.

Sandelowski, M., 2000. Whatever happened to qualitative description? Res. Nurs. Health 23 (4), 334–340. https://doi.org/10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G.

Schubart, J.R., Stuckey, H.L., Ganeshamoorthy, A., Sciamanna, C.N., 2011. Chronic health conditions and internet behavioral interventions. Comput. Inform. Nurs. 29 (2), 81–92. https://doi.org/10.1097/NCN.0b013e3182065eed.

Schueller, S.M., Tomasino, K.N., Mohr, D.C., 2017. Integrating human support into behavioral intervention technologies: the efficiency model of support. Clin. Psychol. Sci. Pract. 24 (1), 27–45. https://doi.org/10.1111/cpsp.12173.

Shala, M., Morina, N., Burchert, S., Cerga-Pashoja, A., Knaevelsrud, C., Maercker, A., Heim, E., 2020. Cultural adaptation of Hap-pas-Hapi, an internet and mobile-based intervention for the treatment of psychological distress among Albanian migrants in Switzerland and Germany. Internet Interv. 21, Article 100339 https://doi.org/10.1016/j.invent.2020.100339.

Soucy, J.N., Hadjistavropoulos, H.D., 2017. Treatment acceptability and preferences for managing severe health anxiety: perceptions of internet-delivered cognitive behaviour therapy patients. J. Behav. Ther. Exp. Psychiatry 57, 14–24. https://doi.org/10.1016/j.jbtep.2017.02.002.

Trollor, J.N., Anderson, T.M., Sachdev, P.S., Brodaty, H., Andrews, G., 2007. Prevalence of mental disorders in the elderly: the Australian National Mental Health and Well-Being Survey. Am. J. Geriatr. Psychiatry 15 (6), 455–466. https://doi.org/10.1097/JGP.0b013e3180590ba9.

Vos, J., Craig, M., Cooper, M., 2015. Existential therapies: a meta-analysis of their effects on psychological outcomes. J. Consult. Clin. Psychol. 83, 115–128. https://doi.org/10.1037/a0037167.

Windle, G., Woods, R.T., 2004. Variations in subjective wellbeing: the mediating role of a psychological resource. Ageing Soc. 24 (4), 583–602. https://doi.org/10.1017/S0144686X04002107.