Cost-effectiveness of life-review for older adults with moderate depressive symptomatology: A pragmatic randomized controlled trial☆

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ABSTRACT

Purpose: Life-review has been established as an evidence-based treatment of depression in later life. This study investigates the cost-effectiveness of life-review compared to care-as-usual.

Methods: An economic evaluation alongside a randomized controlled trial was carried out, comparing life-review (n = 100) to care-as-usual (n = 102). Individuals of 55 years and over, with moderate depressive symptomatology, were included. Treatment response was defined as a statistically reliable reduction of depressive symptoms on the Center for Epidemiologic Studies Depression scale. Total per-participant costs encompassed intervention costs, costs of receiving other treatments, participants’ out-of-pocket expenses, and costs stemming from production losses, and were expressed in (2009) euros (€).

Results: At 6-month follow-up, treatment response was 54.0% and 27.5% in the life-review and usual-care conditions, respectively. The difference in effectiveness was statistically significant at p = .001 (2-tailed). In the respective conditions the costs were €5550 and €3162, with the higher costs in the intervention arm of the trial. The incremental cost-effectiveness was €8675 (US$10,227) per improved participant.

Conclusion: The findings suggest that offering life-review rather than care-as-usual almost doubles the likelihood of a favorable outcome. However, the better clinical outcomes are achieved at greater costs. The conclusion that life-review offers good value for money is sensitive to the willingness to pay for a favorable treatment response. It is recommended that life-review is delivered by a single therapist and in larger groups as this may improve the cost-effectiveness of this intervention.

Introduction

Clinical depression in later life is highly prevalent (Copeland et al., 1999; Djernes, 2006; McDougall et al., 2007), characterized by poor prognosis (Beekman et al., 2002; Cole, Bellavance, & Masour, 1999; Licht-Strunk, van der Windt, van Marwijk, de Haan, & Beekman, 2007), and associated with substantial societal costs (Smit et al., 2006). The most important risk factor for developing clinical depression is subthreshold symptomatology (Cuijpers, de Graaf, & van Dorselaer, 2004; Smit, Edeveen, Cuijpers, Deeg, & Beekman, 2006). Therefore, early interventions directed at older adults with depressive symptomatology are of the utmost importance. Meta-analytic evidence indicates that early interventions for older adults with depressive symptoms
are promising in preventing depression (Cuijpers, van Straten, Smit, Mihalopoulos, & Beekman, 2008). Economic costs associated with subthreshold depression are just a little less than those of major depression (Cuijpers et al., 2007). Hence, preventing depression in later life is also important from an economic point of view.

There is substantial meta-analytic evidence that life-review interventions are an effective treatment for depression in later life (Bohlmeijer, Kramer, Smit, Onrust, & van Marwijk, 2009; Bohlmeijer, Smit, & Cuijpers, 2003; Pinquart, Duberstein, & Lyness, 2007; Pinquart & Forstmeier, 2012). Life-review involves a structured evaluation of one’s own life, aimed at integrating negative experiences, resolving conflicts, and giving a positive meaning to life (Westerhof, Bohlmeijer, & Webster, 2010). Recent studies further corroborate the effectiveness of life-review as an early intervention for depression in ecologically valid contexts (Korte, Bohlmeijer, Cappeliez, Smit, & Westerhof, 2012; Pot et al., 2010; Westerhof et al., 2010). We now investigate the cost-effectiveness of life-review compared to care-as-usual. To our knowledge, this is the first economic evaluation of a preventive life-review intervention in late-life depression.

Materials and methods

Study design

The cost-effectiveness analysis was conducted as an a priori component alongside a pragmatic randomized controlled trial, comparing clinical outcomes and economic costs between two groups of participants aged 55 years and over with subclinical, mild, and moderate depressive symptomatology. The experimental group (n = 100) received a life-review intervention to reduce depressive symptoms. The control group (n = 102) received care-as-usual while being wait-listed for life-review six months after baseline. All participants completed measures at baseline (t0) and follow-up (t1; six months after baseline, three months after the end of intervention). This study was approved by the METiGG, a medical ethics committee for research in mental health care settings in The Netherlands. In addition, this study has been registered in the Netherlands Trial Register, the primary Dutch register for clinical trials (TC = 1860). The trial has been described in detail elsewhere (Korte, Bohlmeijer, & Smit, 2009).

Participants

Participants were recruited in collaboration with Dutch mental health services through advertisements in newspapers and information booklets, plus a radio interview and commercials. Applicants were referred to a dedicated website, where they could find information about the study. Thereafter, applicants were assessed for eligibility and were required to sign an informed consent form. In total, fourteen Dutch mental health care services, in both urban and rural areas, participated in this study. They were responsible for the intake procedure, in which inclusion and exclusion criteria were examined. To be included in the trial, participants had to present with a score of ten or higher on the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). Applicants were excluded if diagnosed with a current severe major depressive episode (MDE; eight or nine out of nine symptoms in total) or with a moderate to high suicide risk, as measured with the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). Applicants were excluded if they had a score of 9 or lower on the CES-D (Radloff, 1977), had started taking antidepressant medication or benzodiazepines within the previous 2 months, were currently receiving any psychological treatment, or if the health care professionals found other serious psychopathology, in which case they were referred for psychological treatment. A total of 274 people initially agreed to participate, of whom 225 (82.1%) met the inclusion criteria. Of these, 23 (10.2%) withdrew their consent prior to randomization (see Fig. 1).

Power analysis

A power calculation indicated that a minimum of 80 participants were required in each condition at follow-up to demonstrate an effect size of at least 0.35 (Cohen’s d) in a one-tailed test at α = 0.05 and a power of (1–β) = 0.80. The power calculation was conducted in Stata 7.0 (StataCorp LD, USA). Anticipating a dropout rate of 20% between baseline and the end of the study, 100 participants were sought for each condition at baseline. This requirement was met, with 100 participants in the life-review therapy condition and 102 in the care-as-usual condition.

Randomization

Participants were randomly assigned either to life-review therapy or to care-as-usual by means of a centrally conducted randomization process executed by an independent statistician. The randomization was stratified by gender and presence of current major depressive episode, using a computer-generated sequence of numbers.

Intervention and control group

The life-review intervention, “The Stories We Live By,” adapted from a pilot study (Bohlmeijer et al., 2009), was conducted in groups of four to six participants and consisted of eight weekly sessions of 2 h. The intervention has three core elements. First, the integration of difficult life-events from the past; second, the development of meaningful and agentic life stories that help the participants to better cope with present life-events and to set new goals; third, the retrieval of specific positive memories that can serve as building blocks for the new life stories. The first five intervention sessions were focused on various life themes: origin, youth, work and care, love and conflicts, and loss and difficult times. Before each session, participants had to answer questions about those life themes. For each theme, the participants had to describe one difficult life-event they were still struggling with. They then had to answer questions to help them develop alternative stories that would help to integrate this life-event. During the intervention sessions, participants had the opportunity to exchange and discuss their experiences with one another. In the final three sessions, attention was given to some overarching themes that focused on creating an overview and on the near future. The intervention was guided by one clinical psychologist and one co-therapist (prevention worker) experienced in working with
older adults. Before being allowed to offer the intervention, they were required to participate in a 2-day training session and to adhere to the treatment protocol.

To check whether the intervention had been carried out as intended, one randomly selected session was audiotaped by all participating mental health care services. Two researchers independently scored a treatment integrity measure and solved a few disagreements by consensus. The measure addressed five criteria that were crucial to the proper delivery of the intervention: First, the degree to which therapists followed the structure set out in the intervention protocol. Second, life-review therapy skills encompassed the therapists' skill in terms of asking the right therapeutic questions. Third, empathy measured whether therapists acknowledged participants' feelings and experiences. Fourth, curiosity assessed whether therapists had an attitude of curiosity and not-knowing. Fifth, group process involved the stimulation of a constructive interaction between participants, to create and elaborate alternative life stories. All criteria were assigned a score of 1 (unsatisfactory), 2 (satisfactory) or 3 points (good), with a total score ranging from 5 to 15 (5–8 = unsatisfactory, 9–11 = satisfactory, 12–15 = good). The therapists were scored as satisfactory (60%; 8 out of 14 sessions) or good (40%; 6 out of 14 sessions).

Participants in the control condition received no intervention. However, they had unrestricted access to care-as-usual. In the context of this economic evaluation their health care uptake was monitored and can thus be described in some detail. After the conclusion of the RCT, the life-review intervention was offered to them.

Central clinical outcome

Treatment response was defined as a change of 5 or more points in a favorable direction on the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). This change corresponds with Jacobson and Truax's (1991) criterion for statistically reliable change and is interpreted as a favorable treatment response.
**Resource use and costing**

In this study, a societal perspective was adopted to assess treatment costs, meaning that all costs were considered, regardless of who incurred them. Therefore, all relevant costs were included: health service uptake costs (direct medical costs), patients' out-of-pocket expenses (direct nonmedical costs), and production losses in paid work. Costs deriving from informal care were also included in the analysis.

Data on health care uptake in the previous four weeks were collected with the Trimbos and Institute of Medical Technology Assessment Questionnaire for Costs associated with Psychiatric Illness (TIC-P), a health service receipt survey that is widely used in economic evaluations in The Netherlands (Halkaar-van Rooijen, van Straten, Doner, & Tiemens, 2002). To calculate the costs, units of resource use were multiplied by their standard full economic costs as reported in the Dutch guideline for health economic evaluations (Oostenbrink, Bouwmans, Koopmanschap, & Rutten, 2004). These costs were originally calculated for the reference year 2003, but were indexed for 2009 using the Consumer Price Index from Statistics Netherlands (see Table 1). In order to assess the consequences of the intervention as a whole, costs were set with the time horizon of one year. Therefore, costs will not be discounted.

Direct nonmedical costs were computed as the participants’ travel expenses to receive professional help and loss of leisure time which was valued at €9.20 per hour (Oostenbrink et al., 2004). Informal caregivers (friends, neighbors, family) may have spent time running errands for the study participants and their time was regarded as opportunity cost valued at €9.20/h (Oostenbrink et al., 2004).

Finally, the costs stemming from production losses in paid work were calculated from the number of days that people stayed away from their work (absenteeism) plus the number of days that were spent at work, but with reduced efficiency (presenteeism). Each hour of lost productivity was valued at €52.44 and €39.94 for men and women, respectively, which reflects the average gender and age-specific contribution to the per capita gross national income in The Netherlands by people aged 55 years and over (Oostenbrink et al., 2004). The costs (in euros) can be converted to AU dollars using the purchasing power parity exchange rates reported by the OECD, which at once convert currency and take into account the differential buying power across countries. For the reference year 2009, US$1.00 is equated to €0.848173.

**Per-participant intervention costs**

The costs of offering the intervention consist of the recruitment costs of €10 per successfully recruited participant; 1 intake, lasting 1 h (+30 min for administration) per intake by one clinical psychologist at €136.00/h; 9 sessions (+15 min preparation) per session by one clinical psychologist at €136.00/h and one prevention worker at €100.34/h for eight 2-h sessions, plus one follow-up session in groups of 5 (range 4–6) participants. This amounts to €1171 per participant.

The participants also incurred some costs. These are: 1 course book at €25; time costs (travel, course time, home work) of 50 h at €9.20/h; costs of traveling to the course at €5 per return trip for one intake and nine sessions; and the costs of parking at €2.50/h for the intake plus nine sessions (21.75 h). These costs amount to €589.38 per participant.

**Table 1**

<table>
<thead>
<tr>
<th>Health service type</th>
<th>Direct medical costs (in 2009 €)</th>
<th>Direct nonmedical costs (in 2009 €)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit</td>
<td>Unit cost price</td>
</tr>
<tr>
<td>General practitioner</td>
<td>Contact</td>
<td>22.15</td>
</tr>
<tr>
<td>General practitioner at home</td>
<td>Contact</td>
<td>44.31</td>
</tr>
<tr>
<td>Company doctor</td>
<td>Contact</td>
<td>23.30</td>
</tr>
<tr>
<td>Social worker</td>
<td>Contact</td>
<td>49.35</td>
</tr>
<tr>
<td>Private practice psychotherapist, psychiatrist</td>
<td>Contact</td>
<td>83.36</td>
</tr>
<tr>
<td>Prevention worker</td>
<td>Contact</td>
<td>100.34</td>
</tr>
<tr>
<td>Regional mental health service</td>
<td>Contact</td>
<td>136.00</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>Contact</td>
<td>24.95</td>
</tr>
<tr>
<td>Mental hospital</td>
<td>Contact</td>
<td>96.52</td>
</tr>
<tr>
<td>Medical specialist general hospital</td>
<td>Contact</td>
<td>61.43</td>
</tr>
<tr>
<td>Medical specialist teaching hospital</td>
<td>Contact</td>
<td>109.68</td>
</tr>
<tr>
<td>Alternative treatment</td>
<td>Contact</td>
<td>52.65</td>
</tr>
<tr>
<td>Home care</td>
<td>Hour</td>
<td>33.67</td>
</tr>
<tr>
<td>Informal care (family, friends)</td>
<td>Hour</td>
<td>9.20</td>
</tr>
</tbody>
</table>

**Note.** NA, not applicable. All prices are indexed for 2009 with the Consumer Price Index (CPI), source: http://statline.cbs.nl/statweb/.

- **a** Integral unit cost prices (cf. Oostenbrink et al., 2004).
- **b** Based on average distances (in special tariff taxi and public transport zones) and travel + waiting + treatment times (in h) for receiving treatment (cf. Oostenbrink et al., 2004).
- **c** Costs = (0.18 + #km) + 2.74 + (9.20 * #h). With 0.18 = cost per km; 2.74 = 1 h parking time; 1 zone = 3 km (average between taxi and public transport zones). 1 h time = €9.20 (Oostenbrink et al., 2004).
- **d** Average direct medical cost price per GP surgery contact = €22.15. However, the majority of contacts of older people with their GP concern “medication repeat prescriptions” = €10.47 and the true type of contact in this study is unknown. Therefore we may assume that the real direct medical costs of GP contacts are probably lower.
- **e** No parking costs assumed.
- **f** Only included in the calculation of the intervention costs.
- **g** Own calculation, valued as average of homeopath and acupuncturist (cf. Oostenbrink et al., 2004).
- **h** Valued as domestic help (cf. Oostenbrink et al., 2004).
The total per-participant costs are therefore €1171.18 + €589.38 = €1761 (US$2076).

Analysis

Statistical analyses

The analysis was carried out on an intention-to-treat basis. Therefore, all participants were analyzed in the condition to which they were randomized and missing data were imputed.

Missing clinical endpoints (CES-D scores) were replaced using Missing Value Analysis in PASW 18 to replace missing data by their most likely value under the expectation–maximization (EM) algorithm (Dempster, Laird, & Rubin, 1977). Hence, all participants who were randomized were included in the subsequent analyses. The total percentage of missing data was 15.1%, due to unanswered items (2.4%) or incomplete assessments. Since a comparison of results based on the imputed data (intention-to-treat sample) vs. the observed data (completers-only sample) revealed similar outcomes, only the results from the intention-to-treat analyses are reported.

The dependent variable was treatment response at follow-up. Participants manifesting a reliable change were coded 1 (implying favorable treatment response, “success”) or else 0 (“failure”). The differences in treatment response between the conditions were evaluated using a linear probability model where the treatment dummy was regressed on the treatment response. The analysis took into account that the observations were clustered, as participants were “nested” in each of the 14 different regional mental health services. Therefore, robust standard errors were computed using the first-order Taylor-series linearization method as implemented in Stata version 8.2. Statistical tests were deemed to be significant at \( p < .05 \) (2-tailed).

Cost-effectiveness analyses

Missing cost data (between 1% and 5% depending on the type of costs) were imputed using regression imputation as implemented in Stata with costs as the dependent variable, and age, gender, employment status, education, baseline CES-D depressive symptom levels, and randomization status as predictor variables. In the non-imputed dataset, the average total per-participant cost at follow-up was €5160 (SD = 4660) in the intervention group and €2892 (SD = 6832) in the care-as-usual group. After imputation, the average total per-participant cost at follow-up was €5550 (SD = 5110) in the intervention group and €3162 (SD = 6025) in the care-as-usual group.

The mean total costs for each of the conditions were calculated, both at baseline and 6-month follow-up. Since mean baseline costs were quite similar across both conditions, the incremental costs could be calculated as the between-group difference at follow-up.

Both the incremental costs and incremental effects were used to calculate the incremental cost-effectiveness ratio (ICER). The ICER was calculated as \( \frac{(C_1 - C_0)}{(E_1 - E_0)} \), where \( C \) is the average annual per capita cost and \( E \) is the proportion of people who had a reliable change in depressive symptoms in the experimental and control conditions (subscripted 1 and 0, respectively). The ICER describes the incremental costs for gaining one additional treatment response.

Nonparametric bootstraps were used to simulate 2500 ICERS that were plotted on the cost-effectiveness plane (see Fig. 2). In this way, the degree of uncertainty associated with the ICER is captured. To be more precise, each simulated ICER can be plotted on one of the four quadrants of the ICER plane. In the NE quadrant the intervention produces superior health gains at additional costs relative to routine care. In the NW quadrant less health is produced for additional costs. Clearly, this is the worst possible outcome, and the intervention is then “dominated” by the usual-care condition. In the SW quadrant less health is produced, but there are some cost savings. Finally, in the SE quadrant the intervention generates superior health gains (relative to the comparator condition) and does so for less cost; the intervention then “dominates” the comparator condition.

It is often seen that a new intervention falls in the NE quadrant, because the intervention is successful in generating better health outcomes albeit at higher costs. To decide whether the intervention offers good value for money, we need to know the willingness to pay (WTP) for the health gain. However, WTP is an unknown quantity. We therefore used a series of WTP ceilings and calculated the probability that the intervention is more acceptable than usual care from a cost-effectiveness point of view for each of the WTP ceilings. The relationship between the probability that we must conclude that the new intervention is more cost-effective and each of the WTP ceilings can be plotted in an ICER acceptability curve where increasing WTP levels are placed on the horizontal axis, while on the vertical axis the probability is placed of finding the intervention more acceptable from a cost-effectiveness point of view (see Fig. 3).

Sensitivity analysis

The single most important cost-driver was the intervention: €1761 (US$2076) per participant. It is also a cost-driver surrounded by some uncertainty. To ascertain the robustness of our findings, all analyses were repeated for alternative scenarios: in one scenario the costs of the intervention were increased by 20%; in the other four the costs were decreased by 20% up to 80%.

The intervention costs can also be changed by altering the intervention’s format, such as increasing the group size or reducing the therapist’s time. In the current situation, two therapists participated in all sessions, while the group of participants was rather small. This is an intensive and costly form of therapist guidance. Therefore, all analyses were repeated in two different, less costly scenarios. In the first scenario, the intervention was offered by a single clinical psychologist (instead of both a clinical psychologist and prevention worker). In the second scenario, the intervention was conducted by a clinical psychologist in groups consisting of eight instead of 5 (4–6) persons. All cost-effectiveness analyses were repeated for the two scenarios under four different assumptions. In the first assumption, reducing the costs has no influence on the effectiveness of the intervention. The last three assumptions were more conservative as we assumed that the number of treatment successes was reduced by 5%, 10%, or 15%.

Results

Sample

The participants had a mean age of 63.3 years (SD = 6.48, range 55–83) and were predominantly female (76.7%). Their
education was distributed evenly across three categories: less than 11 years (36.6%), 11 to 14 years (33.7%), and more than 14 years (29.9%). A minority of the participants still had a paid job (15.8%). On average, participants reported one to two chronic medical conditions ($M = 1.49, SD = 1.36$) and they had experienced two to three critical life events in the last three years ($M = 2.34, SD = 1.54$). Participants at baseline scored an average of 20.5 ($SD = 8.6$) on the CES-D (scale 0–60 for depressive symptoms), reflecting moderate depressive symptoms. There were no significant differences in sociodemographic or clinical characteristics between the intervention and the usual-care groups, indicating that randomization had resulted in comparable groups. At baseline, the mean total costs were €601 ($SD = 559$) in the intervention group and €618 ($SD = 531$) in the usual-care group, indicating that randomization produced evenly distributed costs across the conditions.

**Incremental costs**

At follow-up, the average total per-participant costs were €5550 in the intervention group and €3162 in the care-as-usual group. The incremental costs were therefore €5550 − €3162 = €2388 (US$2815).

**Incremental effectiveness**

In the intervention group 54/100 (54.0%) responded well to the treatment. In the care-as-usual group this was 27/102 (26.5%). The difference in effectiveness was therefore .540 − .265 = .275 (27.5%), likelihood ratio = 2.0, and NNT = 3.6. This difference was evaluated using a linear probability model while taking into account the clustered data structure. In this model the 95% confidence interval of the risk difference ranged from 0.36 to 0.415 and the mean risk difference of .275 was associated

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**Fig. 2.** Distribution of bootstrapped ICERs ($N = 2500$) on the cost-effectiveness plane, primary analysis.

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**Fig. 3.** Cost-effectiveness acceptability curve: probability that the intervention is acceptable (vertical axis) relative to routine primary care given varying thresholds for willingness to pay (horizontal axis), based on 2500 bootstrap replications.
with a robust standard error of 0.065, \( t = 4.24 \), and \( p = .001 \) (2-tailed), indicating that the intervention was superior.

Incremental cost-effectiveness

The incremental costs were €2388 and the incremental effects were 0.275. Therefore, the mean incremental cost-effectiveness ratio (ICER) was estimated to be €2388/0.275 = €8675 (US$10,227) for an additional treatment response. Using the 2500 bootstraps, the median ICER and its 95% confidence interval could be estimated as €8873 (US$10,461) (95% CI: €1968–€23,023).

On the incremental cost-effectiveness plane, each dot represents one simulated ICER. Of these, 95.2% fall in the NE quadrant, indicating a probability of 95.2% that by applying the intervention a health gain is produced, but at additional cost. In addition, another 4.8% of the simulated ICERs fall into the SE quadrant, indicating that more health is generated for less cost by the intervention relative to care-as-usual (see Fig. 2).

Acceptability

The incremental cost-effectiveness acceptability curve suggests that when the willingness to pay for a favorable treatment response is €10,000, €20,000, or €30,000, then the life-review intervention would have a probability of being regarded as more cost-effective than usual care by 57.2%, 93.3%, and 99.0%, respectively (Fig. 3). It can now be concluded that the intervention must be regarded as acceptable from a cost-effectiveness point of view when there is a willingness to pay €10,000 for generating one additional treatment response.

Sensitivity analysis

It appeared that increasing (by 20%) or decreasing (by 20%, 40%, 60%, or 80%) the intervention costs did not affect the overall conclusion that the intervention produces better health at additional costs, compared with routine primary care (Table 2).

We compared the standard intervention with two less costly scenarios, the first in which the standard intervention was offered by a single therapist, and the second in which the intervention was implemented by a single therapist in (larger) groups of eight persons (Table 2). When the assumption was made that a less costly intervention has no influence on the effectiveness, both scenarios were more cost-effective than the standard intervention. When it was assumed that a less costly intervention reduces the number of treatment successes (by 5%, 10%, and 15%, respectively), the first scenario was still more cost-effective than the standard intervention at a 5% reduction, while the second scenario was still more cost-effective at a 10% reduction in effectiveness.

Discussion

Main findings

This study was conducted to assess the cost-effectiveness of life-review as an early intervention of depression in later life, compared with care-as-usual. The proportion of participants who had a reliable change in depressive symptoms was significantly higher in the intervention group: 54% against 26.5% in Table 2

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>No change in success rate</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>No change in success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost, €</td>
<td>Effect</td>
<td>ICER, € (median)</td>
<td>Cost, €</td>
<td>Effect</td>
<td>ICER, € (median)</td>
</tr>
<tr>
<td>Standard life-review intervention</td>
<td>2388</td>
<td>0.28</td>
<td>8675</td>
<td>0.28</td>
<td>8675</td>
</tr>
<tr>
<td>Adjusted costs of life-review intervention +20%</td>
<td>2740</td>
<td>0.28</td>
<td>9954</td>
<td>0.28</td>
<td>9954</td>
</tr>
<tr>
<td>−20%</td>
<td>2036</td>
<td>0.28</td>
<td>9396</td>
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</tr>
<tr>
<td>−40%</td>
<td>1684</td>
<td>0.28</td>
<td>8116</td>
<td>0.28</td>
<td>8116</td>
</tr>
<tr>
<td>−60%</td>
<td>1332</td>
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<td>6837</td>
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<td>6837</td>
</tr>
<tr>
<td>−80%</td>
<td>980</td>
<td>0.28</td>
<td>5558</td>
<td>0.28</td>
<td>5558</td>
</tr>
</tbody>
</table>

WTP ceiling, %

| €10,000 | 57 | 59 | 59 | 59 |
| €20,000 | 93 | 93 | 93 | 93 |
| €30,000 | 99 | 99 | 99 | 99 |

Note. ICER: incremental cost-effectiveness ratio; WTP: willingness to pay. Scenario 1: intervention implemented by a clinical psychologist only (instead of both a clinical psychologist and prevention worker); scenario 2: intervention implemented by a clinical psychologist only (instead of both a clinical psychologist and prevention worker) and groups of 8 (instead of 4–6) persons.

a Cost per disease-free year at 2009 prices.

b Median is the 50th percentile of 2500 bootstrap replications of the ICER.
the control group. Each improved participant cost €5550 in the life-review condition, which was almost twice as much as the amount of €3162 in the usual-care condition. The incremental cost-effectiveness is €8675 (US$10,227) per improved participant. So the life-review intervention produced superior health gains at additional costs relative to care-as-usual. However, it is often seen that a new intervention is successful in generating better health outcomes at higher costs. To decide whether the intervention offers good value for money requires an understanding of the willingness to pay (WTP) for a favorable treatment response. When the WTP is €10,000, then the probability that the intervention is deemed to be more cost-effective than usual care is .57. When the WTP is raised to €20,000, then this probability has risen to .93 of being the preferred option. This suggests that at WTP ceilings of €10,000 and above the intervention must be regarded as offering good value for money. With the same thresholds, sensitivity analyses confirmed the robustness of the findings. Besides, it was shown that the intervention would have been more cost-effective when delivered by a single clinical psychologist instead of both a clinical psychologist and prevention worker. The cost-effectiveness increased even more when, in addition, the intervention was delivered in groups of 8 (instead of 4–6) persons. These findings remained robust when taking into account that reduced therapist involvement might be associated with a lower effectiveness of the intervention, i.e., when it was assumed that the number of successes was reduced by 5% and 10%, respectively. Therefore, we recommend that life-review should be delivered by a single therapist and in larger groups as this may improve the cost-effectiveness.

To our knowledge this study is the first economic evaluation of life-review. For this reason, we have to compare our results with other cost-effectiveness studies on early interventions to prevent depression in older adults—which are also rather scarce. A recent study found that a stepped-care approach might be cost-effective in preventing depression and anxiety in later life (van’t Veer-Tazelaar et al., 2010). So it might be worth investigating if life-review is more cost-effective when offered as a second or third step in a stepped-care framework. Another option worth investigating is offering life-review online. Internet-based interventions have the potential to reach target groups who cannot be reached by more traditional treatments (Cuijpers & Schuursmans, 2007). Besides, a first promising study shows that online interventions can be effective in reducing both anxiety and depression in later life (Spek et al., 2007), and in fact can be cost-effective (Warmerdam, Smit, van Straten, Riper, & Cuijpers, 2010).

Strengths and limitations

The research findings should be interpreted with some caution. First, due to the relatively short time-horizon of six months we do not know how the cost-effectiveness of life-review is affected after a longer follow-up period. Second, costs and effects were based on an imputed dataset, which might have biased the findings. However, completers did not differ from noncompleters on any of the baseline variables, which attests to the robustness of our findings. Third, the measures in our study were based on self-report, and this may have introduced recall bias. For example, self-report of health care uptake might be underestimated (van den Brink, van den Hout, Stiggelbout, van de Velde, & Kievit, 2004). The strengths of this study were its attempt (the first) to study the cost-effectiveness of life-review, its randomized design, and its demonstration of effects in a natural setting. Furthermore, because health care utilization data were available, it was possible to study the cost-effectiveness of life-review from a societal perspective.

Concluding remarks

This study is the first preliminary economic evaluation of a life-review intervention. Findings suggest that offering life-review rather than care-as-usual almost doubles the likelihood of a favorable outcome. These better clinical outcomes, however, are achieved at greater costs. The conclusion that life-review offers good value for money is sensitive to the WTP ceiling that one is willing to employ. One way to improve the cost-effectiveness may be to deliver life-review interventions by a single therapist and in larger groups. More studies with longer follow-up periods are needed to further substantiate the cost-effectiveness of life-review.

Authors’ contributions

JK co-designed the study, supervised the data collection, analyzed the data, and wrote the paper. CMM co-analyzed the data and wrote the paper. ETB co-designed the study and assisted with the writing of the paper. GJW assisted with the writing of the paper. FS was the supervisor of this project and wrote the paper. All authors read and approved the final manuscript.

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