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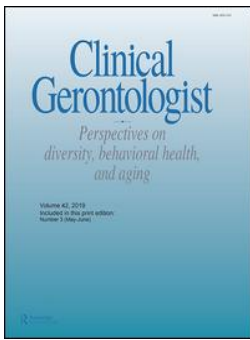
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Supported Web-Based Acceptance and Commitment Therapy for Older Family Caregivers (CareACT) Compared to Usual Care

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ABSTRACT

Objectives: The objective of the present study was to investigate whether an acceptance and commitment therapy (ACT)-based web-intervention (Group 1, CareACT), or a standardized rehabilitation in a rehabilitation center (Group 2) was effective in enhancing the psychological well-being of family caregivers aged 60 and over compared to support provided by voluntary caregiver associations (Group 3).

Methods: Altogether, 149 family caregivers participated in this quasi-experimental study. Primary outcome measure was depression. Secondary outcomes included anxiety, sense of coherence, quality of life, psychological flexibility, experiential avoidance, and thought suppression. The questionnaires were administered at baseline, and four, and 10 months post-measurement. We investigated differences in the changes between the groups using Mplus modeling techniques.

Results: Regarding the main outcome of depression, the results suggest that the CareACT intervention was superior to standardized rehabilitation and to the support given by caregiver associations at four months, both showing a medium-sized difference between the groups. However, the change from four to 10 months post-intervention was not significantly different between these groups ($d = 0.32\text{--}0.36$). Thought suppression showed a significantly different change between the three groups from baseline to four months and to 10 months post-measurement ($p = .038$).

Conclusions: Web-based ACT may have beneficial effects on depressive symptoms and thought suppression in older caregivers.

Clinical implications: Web-based ACT could be a feasible alternative to institutional rehabilitation and support provided by voluntary caregiver associations. Web-based ACT responds flexibly to the needs of caregivers and provides them an opportunity for learning new skills to promote well-being.

KEYWORDS

Family caregivers; community-dwelling older adults; rehabilitation; psychological well-being; depression; thought suppression; quality of life; online; web-based; acceptance and commitment therapy

Introduction

Worldwide, people are living longer. It is estimated that the world's over-60 population will nearly double from 12–22% between the years 2015 and 2050 (World Health Organization (WHO), 2018). More resources and care providers will be required to meet the needs of older adults for health care services. Family caregivers play an essential role in providing care and assistance with day-to-day activities to persons with chronic illness, disability, and/or cognitive impairment (e.g., Elliott & Pezent, 2008; Roth, Fredman, & Haley, 2015). Caregiving responsibilities have been associated with negative effects on caregivers' physical and mental health, with depression, stress, and reduced well-being being

among the most prevalent negative outcomes (Jowsey, McRae, Gillespie, Banfield, & Yen, 2013). Family caregivers of older adults face unique stressors due to increasing age-related medical comorbidities (Adelman, Tmanova, Delgado, Dion, & Lachs, 2014; Shim, Barroso, & Davis, 2011). Past research has shown that caregivers' use of coping strategies can impact the experience of caregiver distress, offering a modifiable target for rehabilitative and psychological interventions that address coping (La Fontaine, Jutilla, Read, Brooker, & Evans, 2016).

Recent years have seen the emergence of eHealth interventions in the provision of counseling and support to family caregivers. Compared to, for example, face-to-face interventions, eHealth

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interventions offer a wide range of benefits, such as greater cost effectiveness and easy access to family caregivers who are often home-bound with their relatives and, thus, are limited by geographic, mobility, and time constraints. Meta-analyses and reviews of Internet-based interventions for family caregivers of older adults have found evidence of improvements in mental health, particularly in relation to depression, stress, and anxiety. This adds to the fact that technology-based interventions have been well received by caregivers (see, e.g., Boots, De Vugt, Van Knippenberg, Kempen, & Verhey, 2014; Guay et al., 2017; Hopwood et al., 2018; Sherifali et al., 2018; Sin et al., 2018).

Acceptance and commitment therapy (ACT) is a new approach in the area of process-based cognitive-behavior therapies (CBT; Hayes, Strosahl, & Wilson, 2012; Hofmann & Hayes, 2019). Several meta-analyses have supported its effectiveness across a range of psychological problems, including stress, depression, and anxiety disorders (Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009; Ruiz, 2010). ACT may be a suitable approach for older adults as it fosters acceptance of inevitable changes and losses associated with old age (Roberts & Sedley, 2016). The existing research on the use of ACT in older adults is limited to rationales (Petkus & Wetherell, 2013), case studies (Roberts & Sedley, 2016), and pilot studies (Davison, Eppingstall, Runci, & O'Connor, 2017). The results of a pilot feasibility study for generalized anxiety disorder (GAD) in older adults suggested that ACT was feasible for older adults with GAD and that it may be effective at reducing depressive symptoms and worry (Wetherell et al., 2011). A study investigating older U.S. veterans with depression (Karlin et al., 2013) showed that ACT was effective at decreasing symptoms of depression and enhancing quality of life. In addition to substantial amount of research with dementia caregivers conducted by Losada and his group (e.g., Losada, Márquez-González, Romero-Moreno, & López, 2014; Losada et al., 2015; Márquez-González, Romero-Moreno, & Losada, 2010), meta-analyses have suggested that acceptance-based interventions are beneficial for diverse groups of family caregivers. A meta-analysis by Collins and Kishita (2019) revealed that mindfulness and acceptance-based interventions, including ACT, were largely effective at

reducing symptoms of depression in dementia caregivers. In addition, Han, Yuen, and Jenkins (2021) investigated the effects of ACT on caregivers of children and found moderate effects on depressive symptoms and quality of life. However, ACT intended for the sole use of older family caregivers is rare.

According to the ACT model, psychological flexibility is one of the key elements of psychological health (Hayes et al., 2012; Kashdan & Rottenberg, 2010), with six core processes producing psychological flexibility and serving as the mechanisms of change: values (identifying life values), value-based actions (increasing meaningful behaviors), present moment (taking a mindful stance to thoughts and emotions), self-as-context (a flexible sense of self), defusion (detaching from unhelpful thoughts and emotions), and acceptance (being open to unwanted thoughts and emotions without avoidance). Evidence shows that psychological flexibility plays a protective role against diverse health-related symptomatology (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Recabarren, Gaillard, Guillod, & Martin-Soelch, 2019), while avoidant coping strategies, including thought suppression, have been found to be associated with elevated symptoms of depression and anxiety in older adults (Petkus, Gum, & Wetherell, 2012) and family caregivers of persons with dementia (García-Alberca et al., 2012; Spira et al., 2007). According to Li, Cooper, Bradley, Shulman, and Livingston (2012), interventions aimed at increasing emotional support and acceptance-based coping strategies produced improvements in dementia family caregivers' psychological well-being, including depression and anxiety.

As acceptance-based coping styles are considered important factors in lowering the risk of depression and anxiety, Gallagher-Thompson et al. (2012) have pointed to the promising nature of interventions that support these coping styles and help caregivers become more aware of their values. Enhancing these skills, for example through ACT, may imply better psychological health and quality of life for family caregivers (Márquez-González et al., 2010). Clarification of individually meaningful life goals and values may assist family caregivers in devoting more time for themselves instead of focusing only on their caregiving role (Tatangelo, McCabe, Macleod, & You, 2018).

Acceptance skills may assist caregivers to better accept the illness of their loved one and adapt to the challenges involved in care (Boots et al., 2014). Moreover, a more mindful stance regarding thoughts and feelings may help caregivers to focus more on the present moment instead of excessively worrying about the future (Tatangelo et al., 2018).

In Finland, community-dwelling family caregivers are supported through, among others, activities organized by family caregiver associations and multimodal institutionalized rehabilitation. However, access to institutionalized rehabilitation is limited and a large number of family caregivers live in remote areas with limited access to services. As there is a need for interventions that respond flexibly to the needs of caregivers without compromising efficacy, interventions offering ACT online may be worth investigating. To the best of our knowledge, there have been no trials investigating the effectiveness of guided ACT-based online interventions for enhancing the well-being of older family caregivers.

Aim and research questions

The purpose of the present study was to develop and investigate whether a novel ACT-based online intervention was effective in enhancing the psychological well-being of family caregivers aged 60 and over. More specifically, we compared whether the guided 12-week web-based intervention CareACT (Group 1) or the standardized institutional rehabilitation of family caregivers (Group 2 representing usual care) was superior in reducing depressive symptoms compared to the activities offered by voluntary caregiver organizations (Group 3). We also assessed changes over time in depressive symptoms (primary outcome), anxiety, sense of coherence, quality of life, psychological flexibility, experiential avoidance, and thought suppression (secondary outcomes).

Methods

Recruitment and design

As a Research and Development (R&D) project, the study, which was funded by the Finnish Social Security Institution, applied a quasi-experimental study design (ref Lappalainen, Pakkala, &

Nikander, 2019). Family caregivers aged 60 and over were recruited from 2017 to 2018 through advertisements (Group 1), rehabilitation centers (Group 2), and caregiver associations (Group 3). For the web-based CareACT intervention, caregivers were recruited using advertisements in local newspapers. Using two questions, a telephone screening was conducted to ensure study eligibility and screen for possible cognitive impairment related to memory: *Have you recently been concerned about your memory? If yes, how do problems with your memory manifest in your daily life?* Sixty-five caregivers who reported no memory problems but experienced distress and depressive symptoms (≥ 9 points) according to the Depression Scale (DEPS, Salokangas, Poutanen, & Stengard, 1995) were interested in the web-based intervention, 59 of whom participated in the baseline measurement (Group 1, $n = 59$). A total of 52 family caregivers (Group 2) were recruited from three rehabilitation courses and assessed. Forty-six caregivers (Group 3) were recruited from five family caregiver associations, with a total of 38 caregivers participating in the baseline measurement. Figure 1 offers an overview of the procedure.

The inclusion criteria were as follows: 1) being a family caregiver providing care to a spouse or child, 2) at least 60 years of age, 3) perceiving caregiving burden, exhaustion, and/or depressive symptoms, and finally, for Group 1 only, 4) Internet access. Potential participants were excluded from the study if they were diagnosed with a severe mental disorder or if they reported memory problems or parallel psychological treatment.

Participants

Altogether, 149 family caregivers participated in the baseline measurement. Most of them were women ($n = 120$; 81%) and care-recipient spouses ($n = 134$; 90%), and they had a mean age of 72.9 years ($SD = 6.1$; range 60–88). Only five caregivers (3.4%) provided care to their children and ten (6.6%) provided care to other family members. Approximately half of them (48%) of them had at least 9–12 years of education. Most of them lived in the same household as the care recipient and had been caring for

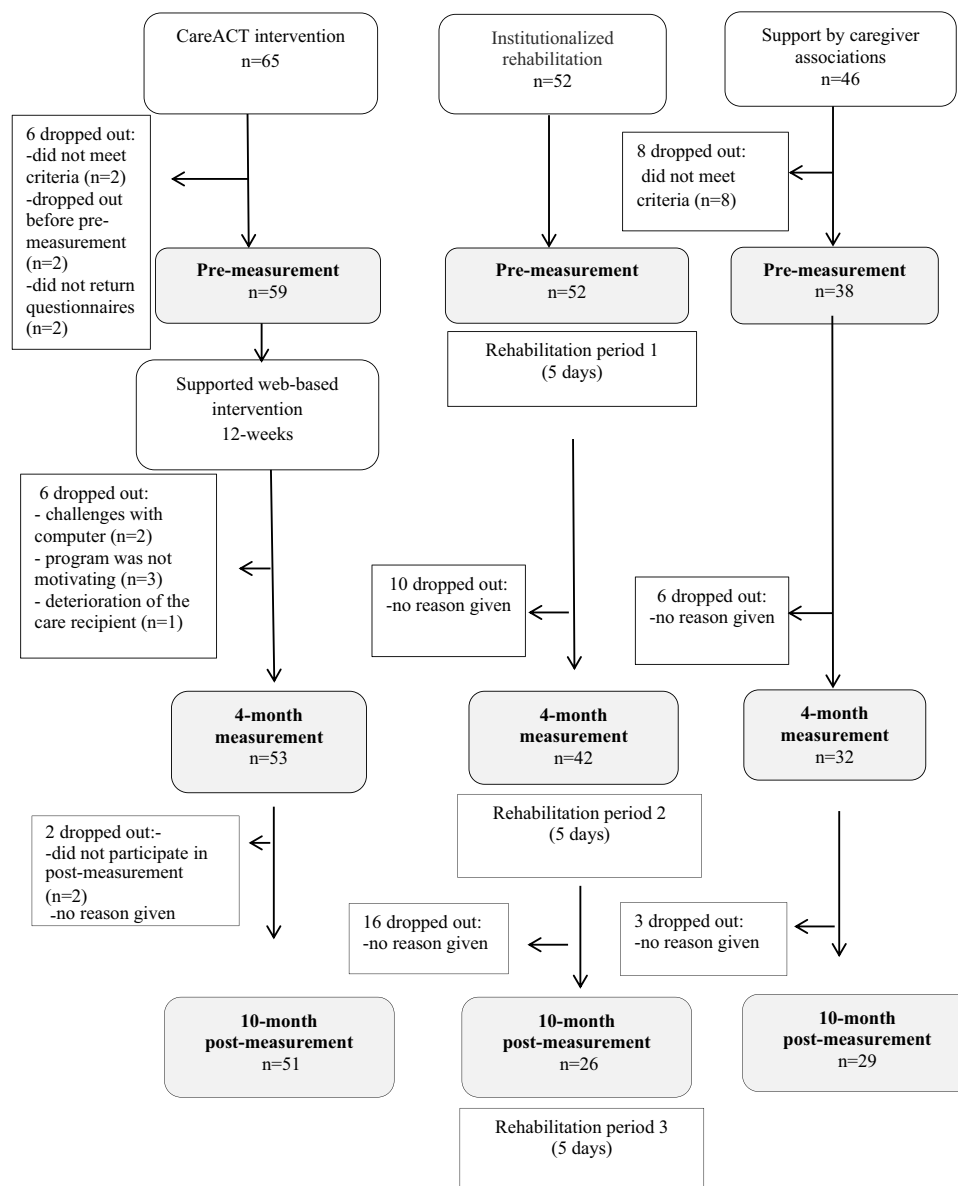


Figure 1. Flow of the participants.

their family member for over five years ($n = 77\%$). The mean age of the care recipients was 75.9 ($SD = 11.4$), and the most frequent diagnoses were memory disease (26%) and stroke (24%). The groups differed statistically significantly from each other with regard to age ($p = .028$), with caregivers in the institutional rehabilitation group being older than those in the caregiver association group ($p = .032$). The groups were similar in terms of objectively measured physical performance (The Short Physical Performance Battery [SPPB]; Guralnik et al., 1994); a range of 0–12 points), which was on a good level in all the groups (range 10.2–10.8).

The SPPB was carried out for the caregivers at baseline, with assessments of gait speed, chair stand, and balance. Table 1 shows the personal characteristics.

The study was performed in accordance with the Declaration of Helsinki and approved by the Ethical Committee of the Central Finland Health Care District (approval number 3E/2016), November, 24, 2016. The study was retrospectively registered with www.clinicaltrials.gov, with the identifier NCT03391596 on January 4, 2018. Written informed consent was obtained from each participant.

Table 1. Baseline characteristics for family caregivers.

	CareACT (web) n = 59	Institutional rehabilitation n = 52	Caregiver organizations n = 38	All n = 149
Age [Mean (SD)]	72.3 (6.3) range 59–88	74.7 (6.1) range 60–88	71.4 (5.3) range 61–86	72.9 (6.1) range 59–88
Sex	48 (81.4%)	39 (75%)	33 (86.8%)	
Female	11 (18.6%)	13 (25%)	5 (13.2%)	120 (80.5%)
Male				29 (19.5%)
Marital status				
Married or living together	56 (94.9%)	44(84.6%)**	35 (92.1%)	135 (90.6%)
Unmarried	1 (1.7%)	1 (2%)	1 (2.6%)	3 (2%)
Divorced	2 (3.4%)	-	2 (5.3%)	4 (2.7%)
Education				
Low	9 (15.3%)	17 (32.6%)	14 (36.9%)	40 (26.8%)
Middle	35 (59.3%)	18 (34.6%)	18 (47.4%)	71 (47.7%)
High	15 (25.4%)	10 (19.2%)	6 (15.8%)	31 (20.8%)
Caregiver has a disease or diagnosis	53 (89.8%)	38 (73.1%)**	34 (89.5%)	125 (83.9%)
Care recipient				
Spouse	54 (91.5%)	51 (98%)	29 (76%)	134 (89.9%)
Father or mother	2 (3.4%)	1 (2%)	3 (8%)	6 (4%)
Other Family member	2 (3.4%)	-	2 (5%)	4 (2.6%)
Child	1 (1.7%)	-	4 (11%)	5 (3.4%)
Age of the care recipient [Mean, (SD)]	76.1 (10.4) range 29–96	77.8 (7.3) range 62–96	73.2 (15.8) range 25–96	75.9 (11.4) range 25–96
No. of years providing care				
Less than a year	4 (6.8%)	2 (3.8%) ***	-	6 (4%)
1–2 years	3 (5.1%)	9 (17.3%)	2 (5.3%)	14 (9.4%)
2–5 years	19 (32.2%)	13 (25.0%)	10 (26.3%)	42 (28.2%)
Over 5–years	31 (52.5%)	19 (36.5%)	26 (68.4%)	76 (51%)
Receives family care allowance	42 (71.2%)	39 (75%)**	32 (84.2%)	113 (75.8%)

Low >9 years; Middle 9–12 years, High > 12 (university, college etc.)

* missing information, n = 57;

** missing information, n = 45

*** missing information, n = 43

**** missing information, n = 49

Interventions

The CareACT intervention (group 1)

The CareACT intervention consisted of a 12-week web-based program, The Own Path, which was based on ACT processes. The content of the web-program was divided into six progressive intervention modules on ACT processes, enhanced with a compassion module (see Table 2). The caregivers also had access to a web diary, a list of favorite exercises, and peer support in the form of a discussion board, offering them the opportunity to discuss among themselves. Each of the modules ended with a well-being exercise where the caregivers could reflect on the most important issues of the module in the form of a written assignment, to which the coaches had access during the intervention. A more detailed description of The Own Path program has previously been published (Lappalainen et al., 2019), and its detailed content can be found in <https://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-019-1071-9>.

Along with the web-based program, the CareACT intervention included support from trained coaches who were psychology and gerontology students (n = 24). The task of the coach was to carry out an SPPB measurement and an interview during a personal meeting and support the caregiver throughout the intervention. The 1.5--2-hour meetings were arranged either at the caregivers' homes or on the university premises. During the visit, the SPPB was administered, and a structured interview (45 min) was conducted (see Strosahl, Robinson, & Gustavsson, 2012). A tablet computer was provided to those who did not have a PC of their own. The participants received supportive telephone feedback from the coach every two weeks, at the end of each module, which amounted to a total of six phone calls. The coaches were instructed to spend 15–20 minutes on each call; however, the phone calls ranged from 5–50 minutes. The task of the coaches was to answer possible questions related to the current module and briefly discuss the homework and

Table 2. The content of the *Own Path* web-program.

Module and ACT process	Content of the module
Introduction	Introduction to the program and reflections on caregiving
Step 1: Your Life (Values)	What is important in caregiving? How can I take care of myself?
Step 2: From Words to Actions (Value-based Actions)	Even small steps count, loneliness, cherish your friendships
Step 3: Feelings: Learn to notice your feelings and be more accepting toward them (Present moment)	Feelings in caregiving: learn to be more aware of your feelings. Learn to notice them and to cope with them.
Step 4: Mind is a Storyteller (Defusion and Self-as-Context)	Learning to observe your thoughts without being caught up in them.
Step 5: Acceptance	Learning to live with your unwanted guest: the illness of your nearest, the situation where you are in right now. Accept what you cannot change, accept your feelings and thoughts
Step 6: Compassion	Self-compassion and compassion toward others, gratitude for small things in life
Closing words	Short summary and closing words

value-based actions included in the weekly well-being exercise carried out by the caregiver. We did not control for the identity of the coach in our analyses. The well-being exercises are described in detail in <https://bmccgeriatr.biomedcentral.com/articles/10.1186/s12877-019-1071-9> At months four and 10, a meeting following the same structure as the initial meeting was scheduled. The participants continued to have access to the web-based program until 10 months post-measurement.

Standardized institutional rehabilitation provided by rehabilitation centers (group 2)

In this study, the institutional rehabilitation program represented the usual care available to family caregivers in Finland. Rehabilitation courses for family caregivers are funded by the Social Insurance Institution (SII) and intended for people whose daily work is family caregiving (Kela, 2016), who experience symptoms of exhaustion or whose ability to function may be compromised due to their own illness or perceived caregiving burden (Kela, 2016). Individual rehabilitation courses are intended exclusively for family caregivers and last a total of 10 days (5 + 5 days) over a period of six to eight months (Kela, 2016) whereas the courses intended for both caregivers and care recipients lasted a total of 15 days, including a daily four-hour program exclusively intended for care recipients. In addition, the rehabilitation consisted of

home assignments between the in-patient rehabilitation periods, such as promoting patient care ergonomics, physical activities, social contacts, participation in hobbies, and organizational activities, which were checked for completion. A home visit by the rehabilitation care worker was also included. The rehabilitation courses involved a multidisciplinary team composed of a physician, a nurse, a physiotherapist, a psychologist, an occupational therapist, and a social worker. For the caregiver, each in-patient rehabilitation day was eight hours long, including a rehabilitation program lasting five hours. Most of the activities performed during the rehabilitation program were carried out in groups, including group discussions, psychosocial counseling, physical exercise, individual interviews and assessment, and the provision of information regarding caregiver support services (Kela, 2016). Goal setting based on the Goal Attainment Scaling -method (GAS, Kiresuk, Smith, & Cardillo, 1994) was an important part of the rehabilitation, and the goals were regularly evaluated and adjusted. The rehabilitation courses were also provided free of charge. About 75% of the caregivers in Group 2 participated in the 10-month rehabilitation (5 + 5 + 5 days) offered to both the family caregiver and the care recipient. For a more detailed description of the rehabilitation content, see Table 3.

Family caregivers are invited to apply for a rehabilitation course and must present a physician's statement on the need for rehabilitation. The rehabilitation courses involve a multidisciplinary team composed of a physician, a nurse, a physiotherapist, a psychologist, an occupational therapist, and a social worker. For the caregiver, each in-patient-rehabilitation day is eight hours long including a rehabilitation program of five hours. Most of the activities performed during the rehabilitation program are carried out in groups. Activities include, among others, group discussions, psychosocial counseling, physical exercise, individual interviews and assessment, and information about caregiver support services (Kela, 2016). Goal setting based on the GAS method is an important part of the rehabilitation, and the goals are regularly evaluated and adjusted. The rehabilitation courses are provided free of charge. About 75% of the caregivers in Group 2

Table 3. Institutionalized rehabilitation in the rehabilitation center*.

1st in-patient rehab period: 5 days	Getting to know each other Sharing of experiences (group) Introduction to rehabilitation and goal setting for rehabilitation (GAS-method): group discussion led by a staff member; group-based goal setting Individual interviews: examination of the caregiver by a physician and assessment of the current situation (60 min); examination of the care recipient (30 min) by a physician Individual goal setting: at least one goal will be set and recorded in the My Goals form An individual rehabilitation program planned according to the caregiver's situation Physical or mental activities according to an individual plan: muscle strength, aerobics, walking, balance, perception and relaxation exercises, outdoor activities, or rest A closing group discussion: assessment of the rehabilitation period; changes and instructions for the next period
Out-patient	Recreation, outdoor activities, gym, swimming, hobbies, etc. <i>Home assignments</i>
2nd in-patient rehab period: 5 days (4–6 months after the 1st period)	Sharing of experiences and discussion (in groups) Reviewing the goals and achievements of the rehabilitation plan Assessment and possible changes Individual interviews with the staff Physical or mental activities according to an individual plan (see above) Group assessment: a staff member makes a brief assessment of the situation and assesses the need for change Recreation, exercise, gym, swimming, hobbies, etc.
Out-patient	<i>Home assignments</i>
3rd in-patient rehab period: 5 days (7–10 months after the 1st period)	Group discussion: the staff and caregivers discuss the goals set at the beginning of the rehabilitation and their implementation. Experiences are shared about the things learned, as well as the achievements, with the support of the group. Discussion about continued activities in everyday life Individual interviews and meetings with the staff members Physical or mental activities according to an individual plan (see above) Discussion about the progress of the rehabilitation and whether the goals have been achieved Discussion about any necessary rehabilitation activities that need to be undertaken Staff, together with the caregiver, assesses the caregiver's overall situation and daily coping A final individual discussion with the caregiver (the care recipient may take part in the discussion): reviewing the rehabilitation and ensuring that further support at home is available. Evaluation of the progress of the individual goals and setting up a follow-up plan to ensure the continuation of the rehabilitation process

Family caregiver: Rehabilitation day, 8 h, incl. breaks for meals and coffee; rehab program 5 h/day

*5 x 5 in-patient rehabilitation: consisting of periods 1 and 3: only for the caregiver;

5 x 5 x 5 in-patient rehabilitation: consisting of periods 1, 2, and 3: for the caregiver and care recipient;

Care recipient: Rehabilitation program of 4 h/day; participates 2 h/period in the family caregivers' program.

participated in the 10-month rehabilitation (5 + 5 + 5 days) that was offered for both the family caregiver and the care recipient. For a more detailed description of the rehabilitation content, see Table 3.

Support provided by voluntary family caregiver associations (group 3)

There are 69 local family caregiver associations in the country, which provide a variety of no-cost activities to support family caregivers. Family caregivers from five family caregiver associations situated in different parts of the country formed a comparison group. The activities offered to the family caregivers included coaching, training, guidance and counseling on family care issues, the provision of information about available services, peer support groups, recreation, events, excursions, and open cafés. The caregivers in Group 3 participated in peer support groups (90 min) every other

week or every third week. Their participation in other activities was not assessed.

Measurements

The measurements were sent to the participants at the beginning of the study (baseline), at four months (mid), and at 10 months (post) and returned via regular mail. The measurement assessing caregiver burden and caregivers' subjective perceptions of caregiving (COPE, McKee et al., 2003), which was originally selected for the current study, was not included in results as it is more suitable for clinical assessment purposes, and its internal consistency in the current study was low ($\alpha = .30$).

Primary outcome measure

The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-assessment

questionnaire used to measure the severity of depression symptoms. The items are evaluated on a 0–3 scale according to the symptoms experienced in the previous two weeks, with the total score ranging from 0 to 63. A higher score reflects more severe symptoms of depression. The BDI-II has shown strong psychometric support as a screening instrument for depression among older adults in the general population. (Segal, Coolidge, Cahill, & O’Riley, 2008). In this study, Cronbach’s α for the BDI-II was .88.

Secondary outcome measures

Anxiety. The Generalized Anxiety Disorder 7-item (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006) scale is a self-report questionnaire for assessing generalized anxiety disorder. The GAD-7 is composed of seven items with response categories from 0 to 3. Higher scores indicate greater anxiety and correlate with disability and functional impairment. The scale has good psychometric properties (Spitzer et al., 2006), and its validity among older population has also been established (Wild et al., 2014). Cronbach’s α for GAD in this study was .86.

Quality of life. Quality of life was assessed using the WHOQOL-BREF Quality of Life Survey, an abbreviated version of the WHOQOL-100 (Skevington, Lotfy, & O’Connell, 2004). The WHOQOL-BREF is a five-point Likert scale in four domains assessing physical health, psychological health, social relationships, and environment. The survey contains 26 questions scored from 1 to 5, with each domain scored separately. Higher domain scores indicate higher quality of life. The WHOQOL-BREF shows good to excellent psychometric properties (Skevington et al., 2004). In this sample, Cronbach’s α was .87

Sense of coherence. Sense of coherence (SOC) refers to a person’s ability to use existing and potential resources to combat stress and promote health (Antonovsky, 1987). Sense of coherence was measured by the 13-item Orientation to Life Questionnaire, which is an abbreviated version of the original 29-item scale measuring three dimensions: comprehensibility, manageability, and meaningfulness (SOC; Antonovsky, 1987, 1993).

The sum ranges from 13 to 91, with higher scores indicating better outcomes. The scale has been found to have good psychometric properties (Antonovsky, 1993). Cronbach’s α for SOC-13 in this study was .78.

Process measures

Psychological flexibility. Psychological flexibility was assessed using the general Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011). The AAQ-II assesses the ability to accept aversive internal experiences and pursue goals in the presence of these experiences. The questionnaire comprises seven items, with sum scores ranging from 7 to 49 and higher scores indicating a negative outcome, i.e., more experiential avoidance and less psychological flexibility (Bond et al., 2011). The scale indicates satisfactory psychometric properties (Bond et al., 2011). In this study, Cronbach’s α was .91.

Experiential avoidance in caregiving. The Experiential Avoidance in Caregiving Questionnaire (EACQ; Losada et al., 2014) measures experiential avoidance in the caregiving context: 1) active avoidant behaviors; 2) intolerance of negative thoughts and emotions toward the relative; and 3) apprehension concerning negative internal experiences related to caregiving. The questionnaire is composed of 15 items, each rated from 1 to 5. Sum scores are calculated for the subscales, with higher scores indicating worse outcomes, e.g., more avoidance. Acceptable psychometric properties have been reported (Losada et al., 2014), and Cronbach’s α in this sample was .76.

Thought suppression. The White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) was used to measure thought suppression, which is related to obsessive thinking and negative affect associated with depression and anxiety. The 15-item WBSI is scored on a five-point scale from strongly disagree (1) to strongly agree (5). The total score, ranging from 15 to 75, is obtained by summing the scores for the individual items, with higher scores indicating greater tendencies to suppress thoughts. The measure has good reliability and validity (Muris, Merckelbach, & Horselenberg, 1996). In this sample, Cronbach’s α was .92.

Statistical analysis

The sample size for the trial was estimated based on changes in the depressive symptoms (the primary outcome) measured by the BDI-II in a previous study (Chu et al., 2011). A sample size of 50 older family caregivers in each of the three groups was calculated as the minimum required to detect a 5.8-point decrease in the BDI-II to achieve 80% power. The calculations were based on a one-sided general estimation equation model (Liang & Zeger, 1986) using the baseline, four-month mid-intervention, and 10-month post-intervention measurements. We assumed that we would observe a 5.8-point larger decrease in the web intervention and the usual care group compared to the caregiver support group at post-measurement when the baseline difference between the groups was taken into account. Thus, assuming an attrition rate of 20%, a sample size of 123 (41 per group) was expected. Thus, the target sample size was 150 participants, with 50 in each group. As described earlier in the methods, the actual sample size was 149.

Statistical analyses were conducted using SPSS IBM (version 24) to investigate the baseline differences between the groups (ANOVA and chi-square tests). In order to include all the participants in the analyses (independent of whether they dropped out), differences in the change between the three groups from (1) the baseline to the four-month mid-measurement and (2) from the four-month to the 10-month post-measurement were investigated using Mplus (version 7, Muthén & Muthén, 1998–2012). Analyses were performed on all the participants of the baseline measurement. Thus, the intent-to-treat principle was applied, including all the randomized participants in the analyses. Between-group differences in the stability of the outcome measures were examined using multiple-group modeling techniques. A full information maximum likelihood estimation on the assumption of data missing at random was used to analyze incomplete data. When the normality assumption was violated, maximum likelihood with robust standard errors was used. The level of significance was set at 0.05.

We first analyzed whether the changes (from baseline to 4-months and from 4- to 10 months) in the three groups were significantly different,

thus, whether the overall change was different between the groups and, thereafter, whether the pairwise comparisons were significant, for example, whether there was a significantly different change between the online and institutional care from baseline to 4-months, and from 4- to 10 months. In case there were significant differences between the groups at baseline, we completed additional analyses to control for or to remove the differences between the groups. Thus, the data was re-analyzed using the baseline as a covariate. Cohen's *d* was used to estimate the effect sizes (ESs) and reflect the magnitude of the differences between the groups (between-group *d*) and within-group changes (within-group *d*). An ES of 0.2 was considered small, 0.5 medium, and 0.8 large (Cohen, 1988). In order to take into account the possible between-group difference at baseline, the between-group ES at four and 10 months was controlled for the difference at baseline. The within-group ES was calculated from the pre-intervention to the four-month mid-intervention and from the pre-intervention to the 10-month post-intervention.

Results

Dropout rates and satisfaction

Out of a total of 149 caregivers who participated in the baseline measurement, 43 dropped out at post-measurement, leaving a total of 106 (71.1%) caregivers. The data were obtained from 86.4% ($n = 51$) of the caregivers participating in the CareACT intervention, 50% ($n = 26$) of the institutionalized rehabilitation group, and 76.3% ($n = 29$) of the caregiver association group. An examination of the family caregivers' adherence to the online program (CareACT) revealed that the caregivers completed, on average, 87.4% ($SD = 23.8$) of the program. In terms of satisfaction with the CareACT intervention, 83% of the caregivers would recommend the online program to other caregivers, and nearly 70% indicated that the program helped to cope better with everyday life. They appreciated the 24/7 accessibility and peer support, and reported having learned a wide range of well-being skills, including caring for themselves, self-compassion, acceptance, and skills to cope with negative thoughts and emotions, as illustrated by

one of the caregivers: “My attitude has changed. I now have courage to live my own life. I have learned to deal with my own feelings. I can appreciate myself: I am allowed to be tired and think about myself” Figure 1 presents the flow of the study and Table 1 the baseline characteristics at the beginning of the study.

At baseline, significant differences between the groups were found in symptoms of depression and psychological and social quality of life. The caregivers in the CareACT intervention reported more symptoms of depression ($p = .001$), as well as a lower quality of life with regard to the psychological ($p = .005$) and social dimension ($p = .0001$), compared with the caregivers involved in the institutional rehabilitation (Table 3). In the CareACT group, 53% of the participants reported at least mild symptoms of depression (BDI score of at least 14). The equivalent rates were 29% (institutional rehabilitation) and 32% (caregiver association group).

Primary outcome: CareACT vs institutional rehabilitation and caregiver associations

Table 4 presents the estimated means for the treatment conditions across time (baseline to 4 months to post) for symptom measures and quality of life. For depression symptoms – our primary measurement – the analyses showed a significant interaction effect over time (baseline, 4 months, post), indicating differences between the group changes.

In the pairwise comparisons, the web-based CareACT intervention showed significantly greater reductions in depression from the baseline to four-month measurement (from $M = 14.98$ to $M = 10.95$) compared with those in the institutional rehabilitation condition (from $M = 10.00$ to $M = 10.34$) (Table 4, Web vs Inst). The change from four months to the post-intervention was not significantly different between these groups. The between-group ES (Cohen’s d) at the four-month measurement showed a significant medium-sized ($d = 0.70$) difference between the two groups. At the 10-month post-measurement, the difference was 0.32, indicating a small ES in favor of the web-based intervention over institutional rehabilitation. The within-group ES in the CareACT group showed a significant but moderate effect ($d =$

0.65) at the four-month measurement and a small but significant effect at the 10-month post-measurement ($d = 0.37$). The within-group ESs in the institutional rehabilitation were very small ($d = 0.06$ and 0.08 , respectively).

The pairwise comparison of changes in depressive symptoms showed a significant difference between the CareACT and the caregiver association condition from baseline- to four-month measurement, showing that depression symptoms decreased more in the CareACT group (Web: from $M = 14.98$ to $M = 10.95$ vs Assoc: from $M = 12.19$ to $M = 13.19$). The change from four months to the post-measurement was not significantly different between the groups. The between-group ESs for these time points showed a medium-sized difference at four months ($d = 0.70$) and a small difference at 10 months ($d = 0.36$), both in favor of the CareACT group. The within-group ESs from the baseline to four months and from baseline to post-measurement revealed that there was very small or no change in the caregiver association condition in terms of depression symptoms.

At the four-month measurement, there was a 27% decrease in depressive symptoms from the baseline level ($M = 14.98$) in the CareACT group (Table 3). However, depressive symptoms showed a slight increase in both the institutional rehabilitation (3%) and caregiver association (8%) groups. At the 10-month measurement, the decrease in depressive symptoms was still 17% from the baseline level in the CareACT group compared to a four-percent decrease in the institutional rehabilitation group and a one-percent increase in the caregiver association group.

Secondary outcomes: CareACT vs institutional rehabilitation and caregiver associations

Regarding anxiety (GAD), sense of coherence (SOC), physical, psychological, social, and environmental quality of life (WHOQOL), psychological flexibility (AAQ), and experiential avoidance (EACQ), the three groups did not change significantly differently from baseline- to four-month and post-measurements (Table 4), indicating that the changes were relatively similar over time. The within-group ESs also showed that the changes in

Table 4. Pre, 4-month and post-measurements (10-mo) of symptoms and quality of life.

	Web (CareACT) <i>M (SD)</i>	Institutional rehab <i>M (SD)</i>	Associations <i>M (SD)</i>	Web vs Inst <i>p</i>	Inst vs Assoc <i>p</i>	Web vs Assoc <i>p</i>
BDI-II				W = 21.85 (df = 4) <i>p</i> = .001 (a)		
Depr. symptoms						
Pre	14.98 (6.53)	10.00 (5.98)	12.19 (7.76)			
4-months	10.95 (5.82)	10.34 (5.61)	13.19 (8.88)	<i>p</i> = .001	<i>p</i> = ns	<i>p</i> = .001
Effect size (d)	$d_w = 0.65^*$	$d_w = 0.06$	$d_w = 0.12$	<i>d</i> = 0.70*	<i>d</i> = 0.10	<i>d</i> = 0.70*
Post (10-mo)	12.51 (6.86)	9.57 (5.02)	12.32 (8.26)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.37^*$	$d_w = 0.08$	$d_w = 0.02$	<i>d</i> = 0.32	<i>d</i> = 0.08	<i>d</i> = 0.36*
GAD-7				W = 0.072 (df = 2) <i>p</i> = .965		
Anxiety						
Pre	5.77 (3.39)	4.60 (4.18)	5.81 (4.75)			
4-months	5.22 (3.64)	3.88 (4.39)	5.16 (4.25)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.16$	$d_w = 0.17$	$d_w = 0.15$	<i>d</i> = 0.05	<i>d</i> = 0.02	<i>d</i> = 0.02
Post (10-mo)	5.39 (5.20)	3.81 (3.33)	5.03 (4.57)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.09$	$d_w = 0.21$	$d_w = 0.17$	<i>d</i> = 0.11	<i>d</i> = 0.00	<i>d</i> = 0.09
WHOQOL				W = 0.349 (df = 2) <i>p</i> = .840		
Physical						
Pre	62.17 (15.94)	60.73 (13.85)	63.58 (13.87)			
4-months	65.41 (13.50)	60.96 (14.42)	62.21 (14.66)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.22$	$d_w = 0.02$	$d_w = 0.10$	<i>d</i> = 0.20	<i>d</i> = 0.12	<i>d</i> = 0.31
Post (10-mo)	63.07 (14.47)	62.70 (17.26)	65.82 (13.54)	ns	ns	ns
Effect size (d)	$d_w = 0.06$	$d_w = 0.13$	$d_w = 0.16$	<i>d</i> = 0.07	<i>d</i> = 0.02	<i>d</i> = 0.09
WHOQOL Psychological				W = 7.51 (df = 4) <i>p</i> = .111 (a)		
Pre	54.11 (14.59)	62.39 (13.41)	59.08 (16.52)			
4-months	58.97 (12.37)	60.37 (13.10)	60.35 (17.69)	<i>p</i> = .036	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.36$	$d_w = 0.15$	$d_w = 0.07$	<i>d</i> = 0.49*	<i>d</i> = 0.22	<i>d</i> = 0.23
Post (10-mo)	56.70 (14.10)	64.35 (10.74)	61.68 (17.14)	<i>p</i> = .012	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.18$	$d_w = 0.16$	$d_w = 0.16$	<i>d</i> = 0.05	<i>d</i> = 0.04	<i>d</i> = 0.00
WHOQOL Social				W = 7.60 (df = 4) <i>p</i> = .107 (a)		
Pre	54.11 (14.59)	62.39 (13.41)	59.08 (16.52)			
4-months	58.97 (12.37)	60.37(13.10)	60.35 (17.69)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.36^*$	$d_w = 0.15$	$d_w = 0.07$	<i>d</i> = 0.49	<i>d</i> = 0.20	<i>d</i> = 0.05
Post (10-mo)	56.70 (15.00)	64.35 (10.74)	61.68 (17.14)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = .024
Effect size (d)	$d_w = 0.18$	$d_w = 0.16$	$d_w = 0.16$	<i>d</i> = 0.05	<i>d</i> = 0.04	<i>d</i> = 0.00
WHOQOL Environment				W = 1.842 (df = 2) <i>p</i> = .398		
Pre	65.63 (13.75)	69.37 (12.56)	66.32 (14.84)			
4-months	65.58 (14.59)	67.25 (12.16)	66.97 (13.85)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.00$	$d_w = 0.17$	$d_w = 0.05$	<i>d</i> = 0.16	<i>d</i> = 0.20	<i>d</i> = 0.05
Post (10-mo)	66.10 (14.78)	65.73 (11.94)	68.41 (15.42)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (d)	$d_w = 0.03$	$d_w = 0.30$	$d_w = 0.14$	<i>d</i> = 0.31	<i>d</i> = 0.42	<i>d</i> = 0.11
SOC-13				W = 0.716 (df = 2) <i>p</i> = .699		
Sense of Coherence						
Pre	60.39 (9.72)	63.08 (9.06)	62.50 (11.05)			
4-months	61.93 (10.12)	67.10 (9.33)	61.21 (11.80)	<i>p</i> = ns	<i>p</i> = .006	<i>p</i> = ns
Effect size (d)	$d_w = 0.16$	$d_w = 0.44$	$d_w = 0.11$	<i>d</i> = 0.26	<i>d</i> = 0.53	<i>d</i> = 0.27
Post (10-mo)	61.22 (10.84)	64.43 (9.90)	61.77 (12.88)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
	$d_w = 0.08$	$d_w = 0.14$	$d_w = 0.06$	<i>d</i> = 0.06	<i>d</i> = 0.21	<i>d</i> = 0.15

The three columns on the left side of the table show mean values (standard deviation) and within-group effect sizes (d_w) from pre to 4 months and from pre to 10 months (post) for each of the intervention groups. The three columns on the right side of the table indicate whether there were differences in the changes between the three groups during the study (pre, 4 months, and 10 months). The significant difference between the groups is indicated by a significant *p*-value in the Wald (W) test. Pairwise comparisons and between-group effect sizes (*d*) are also reported.

(a) The significant difference between the groups at pre-measurement was controlled when completing the Wald test (df = 4). * = indicates a significant effect size (d).

all three groups from baseline to post-measurement were overall small.

When investigating the process measures (Table 5), only thought suppression (WBSI) showed a significantly different change between the three groups from the baseline to the four-month and post-measurement. The pairwise comparisons between the groups indicated that this was due to the fact that the positive change (decrease in

suppression) recorded in the CareACT group from baseline to the four-month measurement was maintained in the CareACT in the 10-month post-measurement; however, in the institutional rehabilitation group, the WBSI scores returned to the baseline level (Table 5). In the caregiver association group, there were no within-group changes in the WBSI from the baseline to the four-month and post-measurement.

Table 5. Pre, 4-month and post-measurements (10-mo) of the psychological flexibility measures.

	Web (CareACT) <i>M (SD)</i>	Institutionalrehab <i>M (SD)</i>	Associations <i>M (SD)</i>	Web vs Inst <i>p</i>	Inst vs Assoc <i>p</i>	Web vs Assoc <i>p</i>
EACQ total					W = 4.851 (df = 2) <i>p</i> = .088	
Pre	47.10 (7.33)	47.14 (8.19)	43.98 (9.53)			
4-months	43.25 (8.77)	44.80 (8.92)	46.00 (8.24)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.48^*$	$d_w = 0.27$	$d_w = 0.23$	<i>d</i> = 0.19	<i>d</i> = 0.49	<i>d</i> = 0.69
Post	43.69 (9.29)	44.23 (9.85)	45.48 (8.65)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.41^*$	$d_w = 0.32^*$	$d_w = 0.17$	<i>d</i> = 0.06	<i>d</i> = 0.50*	<i>d</i> = 0.58*
WBSI Thought suppression					W = 6.522 (df = 2) <i>p</i> = .038	
Pre	45.70 (12.44)	44.49 (12.59)	43.46 (10.85)			
4 kk	41.53 (11.79)	41.23 (12.68)	43.15 (14.19)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.34^*$	$d_w = 0.26$	$d_w = 0.03$	<i>d</i> = 0.07	<i>d</i> = 0.25	<i>d</i> = 0.33
Post	41.29 (13.97)	45.63 (11.78)	43.11 (12.90)	<i>p</i> = .042	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.33^*$	$d_w = 0.09$	$d_w = 0.03$	<i>d</i> = 0.44*	<i>d</i> = 0.13	<i>d</i> = 0.35
AAQ-II Psych. Flexibility					W = 5.09 (df = 4) <i>p</i> = .278 (a)	
Pre	19.73 (8.56)	16.14 (7.74)	17.79 (8.27)			
4-months	17.84 (7.79)	15.25 (6.41)	18.54 (9.06)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.23^*$	$d_w = 0.13$	$d_w = 0.09$	<i>d</i> = 0.12	<i>d</i> = 0.21	<i>d</i> = 0.31*
Post	18.88 (8.58)	16.51 (6.19)	17.79 (8.50)	<i>p</i> = ns	<i>p</i> = ns	<i>p</i> = ns
Effect size (<i>d</i>)	$d_w = 0.10$	$d_w = 0.05$	$d_w = 0.00$	<i>d</i> = 0.15	<i>d</i> = 0.05	<i>d</i> = 0.10

The three columns on the left side of the table show mean values (standard deviation) and within group effect sizes (d_w) from pre to 4 months, and from pre to 10-months for each of the intervention groups. The three columns on the right side of the table indicate whether the three groups changed differently during the study (pre to 4-months and 4-months to 10-months). The significant difference between the groups is indicated by a significant *p*-value in Wald (W) test. Pairwise comparisons and between group effect sizes (*d*) are also reported. (a) The significant difference between the groups at pre-measurement was controlled when completing the Wald -test. * = indicated that effect size (*d*) is significant.

(a) The significant difference between the groups at pre-measurement was controlled when completing the Wald test (df = 4). * = indicates a significant effect size (*d*).

Discussion

The objective of the present study was to investigate whether an ACT-based online psychological intervention or the standardized rehabilitation program carried out in rehabilitation centers was effective in enhancing the psychological well-being of family caregivers aged 60 and over compared to support provided by voluntary caregiver associations. Regarding the main outcome measure of depressive symptoms, the results suggested that the supported online CareACT intervention produced significant effects on depressive symptoms over the duration of the intervention (12 weeks) and the CareACT intervention was superior to the comparison interventions. However, the treatment effects were not fully sustained at 10 months. Our results are in line with other Internet-based interventions showing small to medium effect sizes for depression (Sherifali et al., 2018) compared to the current study ($d = 0.70$; from baseline to 4 months). In addition, the results are consistent with other psychosocial interventions for family caregivers, which have rarely reported long-lasting effects (see, e.g., Bartels et al., 2019). Older family caregivers are often frail and vulnerable themselves and, due to

their advanced age and elevated risk factors, may benefit less from interventions (Sörensen, Duberstein, Gill, & Pinguart, 2006). It is evident that caregiver burden can be reduced to some extent, but the stressors cannot be totally eliminated (Sörensen et al., 2006). Adjustments to support the caregivers over time might have contributed to better sustained effects. As current interventions should be based on the needs of the caregivers (La Fontaine et al., 2016), persuasive technology elements, such as tailoring may provide new solutions to render the intervention more meaningful and personal to each caregiver's own needs and situation (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012). In tailoring, information about a given individual is used to specify what content he or she will receive (Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008). Furthermore, mobile apps may have the potential to support caregivers (Grossman, Zak, & Zelinski, 2018). In addition, booster sessions may have strengthened the long-term outcomes of the online intervention. Booster sessions have been found to be moderately successful in maintaining treatment outcomes (Whisman, 1990). As their potential to

maintain benefits among caregivers has been scarcely investigated, with mixed outcomes, further research is needed (Ducharme, Lachance, Lévesque, Zarit, & Kergoat, 2015). Based on the current data, it can be concluded that there is a need to offer caregivers intensive online intervention models including support. This conclusion is supported by the fact that the institutional rehabilitation as well as the support provided from the family caregiver associations produced minimal or no changes, and they were less effective compared to the supported online intervention.

With regard to the secondary outcome measures, all three interventions had a small or no effect on the caregivers' anxiety, sense of coherence, quality of life, psychological flexibility, and experiential avoidance which is partially inconsistent with the findings of other studies. While Internet-based interventions have revealed small-to-medium effect sizes for anxiety (Sherifali et al., 2018) and decreased experiential avoidance in a group-based ACT intervention (Losada et al., 2015), the CareACT intervention did not differ significantly from other caregiver groups regarding these outcomes. Instead, the online intervention decreased the caregivers' thought suppression (WBSI), a dysfunctional coping strategy and a specific form of avoidance which has been associated with an increased likelihood of somatic, depressive, and anxiety symptoms in older adults (Petkus et al., 2012). Thus, the study provided evidence demonstrating that the supported online ACT intervention decreased the caregivers' avoidant coping and increased their acceptance-based coping strategies and skills, helping them handle unwanted thoughts and emotions more constructively than in institutional rehabilitation. This is imperative as prior research has shown that avoidant coping, such as thought suppression, is associated with negative outcomes in dementia caregivers (Beinart, Weinman, Wade, & Brady, 2012; Li et al., 2012).

Further, in accordance with studies examining the acceptability of online interventions for family caregivers (Sin et al., 2018), our study found high acceptability in relation to the ACT-based online intervention. In total, 83% of the participants would recommend the online program to other caregivers

and, further, showed high adherence, completing, on average, 87.4% (SD = 23.8) of the program. This is remarkable, as the mean age of the caregivers in the online group was 72.3 years. Nevertheless, these results apply exclusively to older family caregivers with Internet access and who were willing to access support via the Internet.

The findings of this study suggest that web-based ACT may be a more cost-effective and effective alternative to support older caregivers suffering from symptoms of depression than the multidisciplinary institutionalized rehabilitation currently being offered to family caregivers. Access to institutionalized rehabilitation is limited, which calls for new, more accessible and less costly ways for family caregivers to receive support and provide them with skills to cope with challenges in their burdensome caregiving tasks.

Limitations and strengths

The current study is not without limitations, the most important of which was the methodological quality of our study. First, we could not conduct a randomized controlled study, instead undertaking a clinical R&D project aimed at investigating technology that could provide family caregivers with new and accessible means of support in their caregiving activities. Standardized rehabilitation in Finland is institutionalized and organized by the Finnish Social Insurance Institution. Therefore, access to rehabilitation follows a strict standardized procedure that does not allow randomization. We are fully aware of the fact that the greatest quality of evidence is obtainable through randomized controlled trials, which was not possible in this case. Therefore, guided Internet-based ACT for older family caregivers should be further investigated in large, randomized controlled trials. Moreover, there is a need for long-term outcomes comparing the efficacy of Internet-based interventions to traditional face-to-face interventions (Guay et al., 2017).

A second limitation was that the screening procedure differed in each study group, and in particular the caregiver association group (Group 3) did not undergo a screening similar to that applied in selecting the other groups. Third, the caregiver sample for the web-based

intervention was recruited via a newspaper advertisement. Responders to newspaper advertisements might have been selected and more motivated for change than family caregivers in general, which could have been a cause of selection bias in our analyses. Furthermore, at the beginning of the study, the caregivers who participated in the online intervention reported higher levels of depressive symptoms compared to other groups. Although this difference was statistically controlled when investigating the intervention effects, it might have impacted the results. Furthermore, at the beginning of the study, the caregivers who participated in the web-administrated intervention reported higher levels of depression symptoms compared to other groups. Although this difference was statistically controlled when investigating the intervention effects, it might have impacted the results. This study also focused solely on family caregivers aged 60 and over, nearly 90% of whom were spousal caregivers. The distress this caregiver group faces may be somewhat similar to that experienced by parental caregivers caring for their child. However, spousal caregivers are considered more vulnerable because of their older age and associated morbidities (Adelman et al., 2014). The results of this study can be generalized to family caregivers aged 60 and over who are caring, in particular, for their spouses. Lastly, the family caregivers in Group 1 had round-the-clock access to the online intervention over a period of 10 months. Thus, they had the opportunity to work with the program, at their own pace, on several occasions. More research is needed to explore the relationship between the level of usage and the outcomes of web-administrated interventions for family caregivers.

Despite the limitations, the study has some strengths. It included a relatively large number of family caregivers living both in towns and rural areas. In addition, this is the first clinical trial to investigate the effectiveness of a web-based ACT intervention with family caregivers aged 60 and older. This study increased our understanding of the suitability of web-based ACT interventions in supporting older family caregivers. Although the family caregivers

reported only slightly elevated symptoms of depression, the guided web-based ACT intervention decreased symptoms significantly. In fact, the symptoms of depression increased slightly in the control condition during the study period.

Conclusions

In conclusion, a web-based ACT intervention combined with support may have beneficial effects on the psychological well-being of older caregivers, particularly in terms of alleviating depressive symptoms. Given these preliminary results using guided web-based ACT with caregivers, the findings of this study suggest that the intervention is a viable way to support older caregivers and may produce equivalent or better outcomes than costly, institutionalized rehabilitation. In the context of increasing burden placed on health-care and rehabilitation, there is clearly a need for accessible and cost-effective rehabilitation delivery methods. Rehabilitation professionals should explore new ways to expand existing services and utilize technologies that incorporate, for example, web-based ACT programs combined with professional or peer support. Given the large treatment–demand gap, web-based programs would provide family caregivers with an additional or perhaps the only way to obtain psychological support.

Clinical implications

- Web-based ACT intervention combined with support could be an accessible way to support older family caregivers
- Web-based ACT may offer a feasible and cost-effective alternative to institutional rehabilitation programs and support provided by voluntary caregiver associations.
- Rehabilitation professionals should consider incorporating web-based ACT in their treatment options.

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Disclosure statement

Dr. P. Lappalainen and Dr. R. Lappalainen both hold shares (5 and 10%, respectively) in the company responsible for the

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