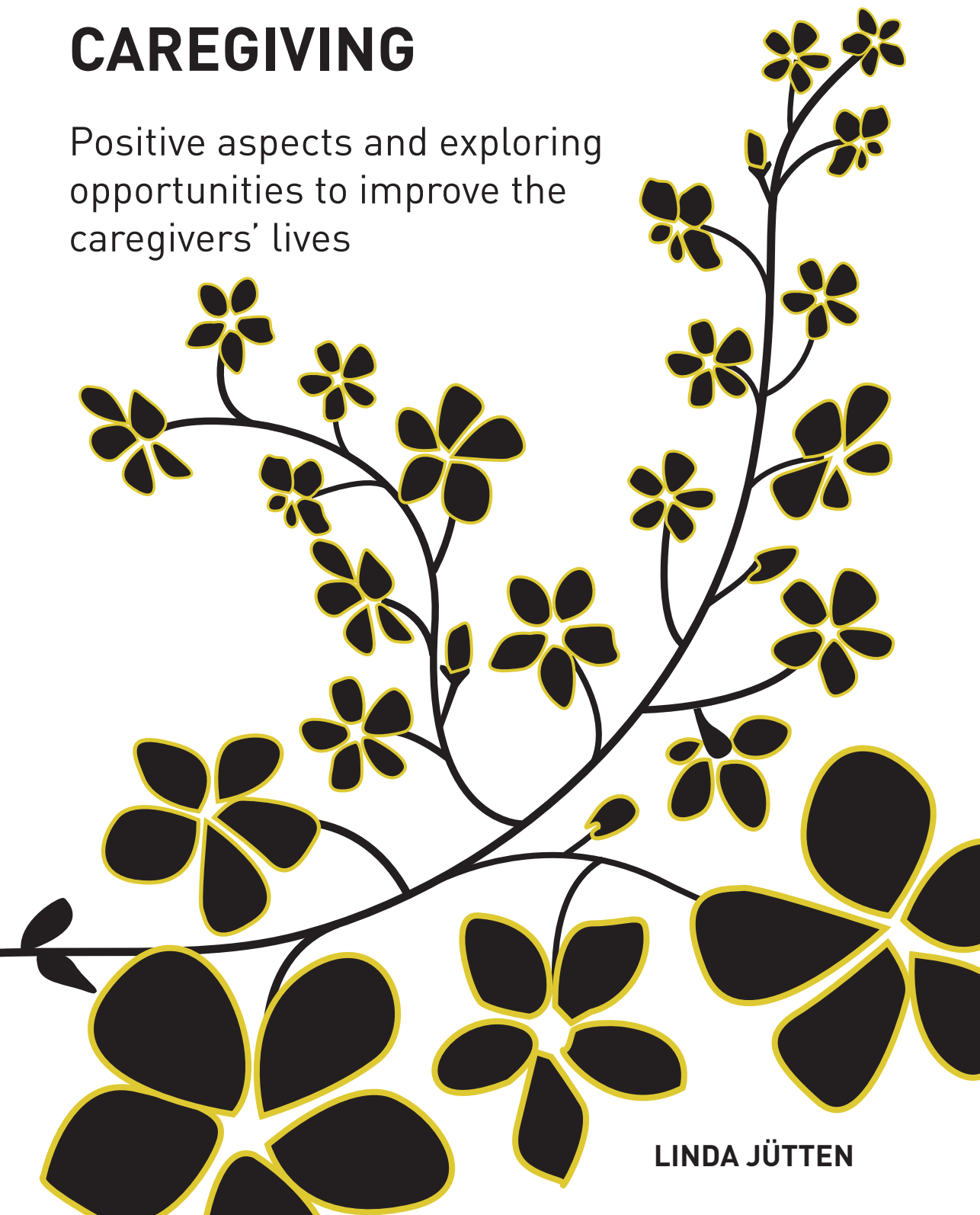


INFORMAL DEMENTIA CAREGIVING

Positive aspects and exploring
opportunities to improve the
caregivers' lives



LINDA JÜTTEN

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Informal dementia caregiving:
Positive aspects and exploring opportunities to
improve the caregivers' lives

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ter verkrijging van de graad van doctor aan Tilburg University,
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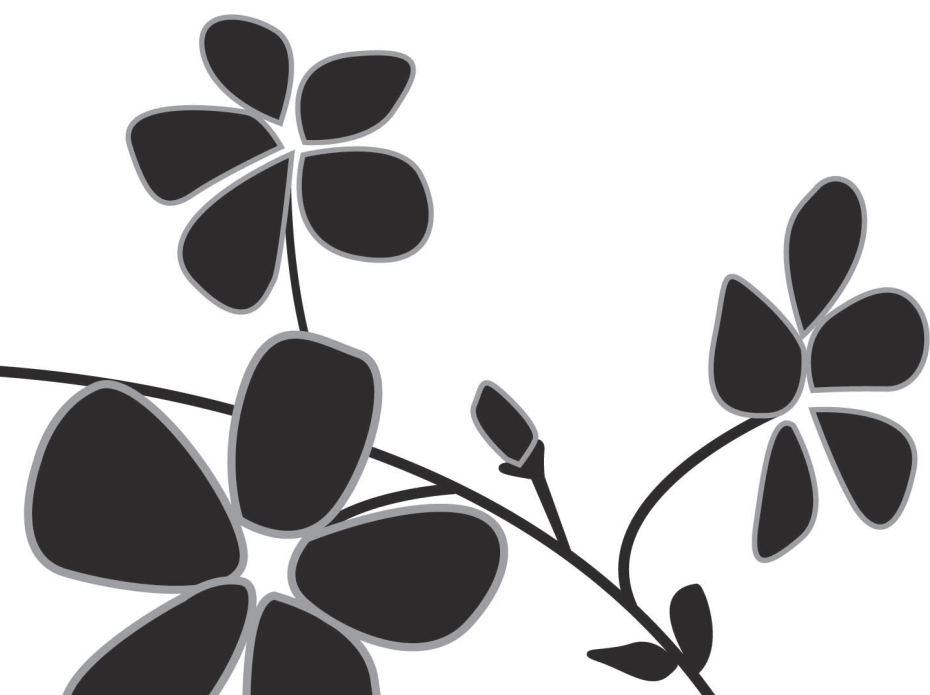
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CHAPTER 1

GENERAL INTRODUCTION

DEMENTIA

Dementia is characterized by a decline from a previously attained level of cognitive functioning, in one or more cognitive domains, which interfere with the daily life and independence of the affected individual.¹ The cognitive domains which can be affected include memory, attention, executive functions, language, perception, and motor functions. Although cognitive decline is the clinical hallmark of dementia, neuropsychiatric symptoms are common and can dominate disease presentation. These symptoms include agitation, depression, delusions, hallucinations, and wandering.²

Dementia ranges in severity from mild, when it is just beginning to affect a person's functioning, to severe, when the person depends on others for basic activities of daily living.³ As a result, people with mild dementia can live at home, whereas most people with severe dementia are institutionalized.

People with dementia can live for many years with the disease, with estimations ranging between three and nine years, depending on numerous factors.⁴ While dementia is more common among older people, it is not a normal part of aging: the cognitive decline is different and more severe than can be explained by age alone^{5,6} and there are important differences in morphological changes in the brain between the healthy elderly and people with dementia.⁷

Dementia subtypes

Dementia is an umbrella term for various subtypes, including Alzheimer's dementia, vascular dementia, frontotemporal dementia, dementia with Lewy bodies, and dementia due to Parkinson's disease. These subtypes differ in etiology, affected cognitive domains, and other clinical features. Alzheimer's dementia and vascular dementia are the two most common subtypes. In Alzheimer's dementia, damage to the brain begins years before the symptoms appear. The accumulation of amyloid plaques, and neurofibrillary tangles consisting of tau protein are thought to contribute to the degradation of the neurons (nerve cells) in the brain and the subsequent symptoms of Alzheimer's dementia.⁸ Alzheimer's dementia is in the early stage characterized by memory impairment. It develops slowly and is progressive, which means that the symptoms gradually worsen over time. Vascular dementia is characterized by a loss of cognitive function resulting from ischemic, hypoperfusive, or hemorrhagic brain lesions due to cerebrovascular disease or cardiovascular pathology. The clinical features typically include an abrupt onset and a fluctuating course.⁹ The symptoms vary widely, depending on the severity of the blood vessel damage and the part of the brain affected. Common early signs are problems with attention and executive functioning.¹⁰ Due to these different subtypes, symptoms, and stages, the dementia population is very heterogeneous.

Prevalence, incidence, and associated costs

Dementia affects people from all over the world, with an estimated world prevalence of 46.8 million people in 2015. This number will almost double every 20 years, to 74.7 million in 2030, and 131.5 million in 2050. It is estimated that there will be 9.9 million new cases each year. This increase is mainly driven by population growth and demographic aging.¹¹ Due to the large number of affected people, dementia has a significant global socioeconomic impact. In fact, dementia is one of the most expensive diseases in the world.¹² These costs can be divided in direct medical costs (19.5%), direct social care costs (40.1%), and informal care costs (40.4%).¹¹ Since there is as yet no cure for any subtype of dementia, medical treatments are limited, typically focused at minimizing (neuropsychiatric) symptoms,² explaining the relatively small portion of costs. Direct social care costs are paid professional home care, and residential and nursing home care. Informal care costs are the informal caregivers' time, lost income, out-of-pocket expenditures for formal caregiving services, and informal caregiver's excess health care costs.¹³ This relatively large portion of costs (40.4%) can be explained by the fact that 70% of the people with dementia live at home, where they are dependent on informal caregivers for their daily care.¹⁴

INFORMAL CAREGIVERS

Informal caregivers are unpaid spouses, daughters, or other family members or friends of the person with dementia. Informal caregivers provide the majority of the daily care for persons with dementia which can include assistance with basic and instrumental activities of daily living (ADLs and IADLs respectively), and medical support (e.g. medication management, scheduling and accompanying people with dementia to medical visits, and making treatment or managing decisions), but also supervision, and providing support and comfort.¹⁵ Studies vary in their criteria for defining who qualifies as an informal caregiver. In some studies, caregivers are the co-residing spouses of persons with dementia who report providing some informal care.^{16,17} Other studies more explicitly state that caregivers are persons who provide help with one or more ADLs or IADLs.¹⁸⁻²⁰ In (clinical) practice in the Netherlands, the most used criteria are spending at least eight hours per week on unpaid caregiving tasks (administrative, hands-on, or other), for more than three months, for a family member or friend with dementia. Approximately two-thirds of all caregivers are women; over one-third of dementia caregivers are daughters of the person with dementia, and it is more common for wives to provide care for a husband than vice versa.²¹ In addition, caregivers differ in age, the type of relationship they have with the person with dementia, e.g. spouse or child, whether or not they live with the person with dementia, how many hours they spend on caregiving, and which tasks they carry out. Consequently, informal caregivers make up a very heterogeneous group, something scientific research has to take into account when generalizing results.

Negative consequences of caregiving

Informal caregiving is often described as a burdensome role. Dementia caregivers are thought to have higher rates of depression,^{22,23} anxiety problems,²² stress,²³ a lower general subjective well-being,²³ and worse physical functioning²⁴ compared to non-caregivers. In addition, they can experience caregiver burden, which can be defined as ‘the degree to which a carer’s emotional or physical health, social life, or financial status has suffered as a result of caring for their relative’ (p. 261).²⁵ These negative consequences occur more frequently in those who care for people with dementia than in caregivers who care for people with other chronic illnesses.²⁶ In the Netherlands, 54% of the caregivers experience a significant amount of burden, and 16% even feel severe burden or overburdening due to caregiving.²¹ This can be explained by the high level of involvement of dementia caregivers in terms of the hours per week that they spend on caregiving tasks, as well as the number of ADL and IADL tasks with which they assist.²⁷ In addition, the behavioral and neuropsychiatric symptoms can have a detrimental impact on the caregivers’ well-being,² and the caregiver’s anticipation that things will only get worse and that this will happen in an unpredictable and uncontrollable manner, can be another contributing factor to the burden.²⁷ It is important to diminish the negative consequences of caregiving, first because they are detrimental to the well-being of the caregivers, but also because this can subsequently lead to a higher rate of institutionalization of the people with dementia.²⁸

However, not all caregivers experience these negative consequences to the same extent. Previous research has tried to identify risk factors for certain negative outcomes. These risk factors can be grouped into caregiver-related factors and factors related to the person with dementia. Regarding caregiver characteristics, female gender,^{22,26} being a spousal caregiver,^{26,29,30} and having a low level of education³¹ are found to be risk factors for these negative consequences. In addition, cohabitation with the person with dementia³¹ and providing a higher amount of informal care^{26,32} have been found to be related to negative outcomes for caregivers. Regarding factors related to the person with dementia, the presence and severity of behavioral disturbances and neuropsychiatric symptoms, and longer disease duration have been found to be associated with adverse caregiver outcomes.^{26,31}

Positive consequences of caregiving

On the other hand, some caregivers (also) experience positive consequences of caregiving, which a growing body of literature is beginning to acknowledge. These potentially rewarding, positive outcomes of the caregiving experience are typically called caregiver gains. Gains are thought to be more than just the opposite of burden, and can co-exist within the same caregiver. For example, Sanders³³ found that 81% of caregivers reported both strains and

gains, whereas 19% reported only strains. There is however no accepted definition yet for gains,³⁴ resulting in many different operationalizations such as satisfaction with the caregiver role, and the feeling of being appreciated or needed. More research on this positive side of caregiving is needed because these aspects might buffer against caregiver burden³⁵ and negative affect,³⁶ and in turn reduce the likelihood that the person with dementia will be institutionalised.^{37,38} Furthermore, the positive side needs to be considered in order to obtain a more comprehensive view of caregiving.³⁹ The lack of information on the positive consequences (and the general focus on the negative), distorts how the caregiving experience is perceived and as such limits research in the field.⁴⁰

Another aspect to consider is the cognitive functioning of caregivers. Previous studies have suggested that caregivers have worse cognition than non-caregivers,⁴¹⁻⁴⁶ which may be due to the negative consequences like elevated levels of stress, depression, and burden. Some went as far as concluding that caregiving is associated with a higher risk of dementia.⁴⁷ However, these findings are not undisputed with Roth et al.²⁰ arguing quite the opposite: that caregivers perform either better or at the same level on cognitive tasks compared to non-caregivers.²⁰ These contradictory findings may be due to several methodological issues of previous studies, such as small groups, sampling bias, and different covariates used in the analyses. More research on this subject is needed, since poorer caregiver cognition can have an enormous impact on the caregiver's lives, and subsequently the quality of care and living situation of the person with dementia.

Interventions for informal caregivers

Many interventions for informal caregivers have been developed in an attempt to diminish the negative consequences of caregiving. These include training and education programs, support groups, counseling, and so-called 'multi-component interventions' that combine two or more of the previous types (*Chapter 7* provides an overview). However, none of the previously studied interventions has tried to heighten empathy and understanding through experiential learning to lower burden. Higher levels of empathy in professional caregivers have been found to be associated with better outcomes for both patients and professional caregivers, like fewer burnout symptoms.⁴⁸⁻⁵⁰ As a consequence, interventions for professionals and medical students have been developed to enhance their empathy in order to optimize professional care. However, some researchers argue that too much empathy can have detrimental effects on professional caregivers.^{48,51} For informal caregivers, the link between empathy, and the negative consequences of caregiving, has only been examined in a few studies,^{52,53} which yielded mixed results. More research on this subject is needed to figure out if heightening empathy could lead to better outcomes for informal caregivers. Experiential learning is learning in which the learner is directly in touch with the realities being studied, instead of only reading, hearing, or writing about it⁵⁴ and can be achieved

by (virtual or augmented) simulation.⁵⁵ Simulation training to enhance understanding and empathy has been proven effective for health care students,⁵⁶ but has to date not been studied in controlled experimental studies with informal caregivers.

Finally, there are many systematic reviews, and a couple of meta-analyses,^{e.g.57-60} examining the effectiveness of psychological interventions for informal dementia caregivers. However, these are very limited in their scope; focusing on only one type of intervention,⁵⁷⁻⁵⁹ or on a specific subgroup such as co-residing caregivers.⁶⁰ Consequently, it is not yet clear how effective these interventions are relative to each other and overall. In addition, it remains unclear if there are intervention characteristics contributing to larger effects. If this were known, interventions could be optimized to support caregivers in their caregiving role.

GENERAL AIM AND OUTLINE OF THE DISSERTATION

The overall aim of this dissertation is to gain a better understanding of the current (neuro) psychological situation informal dementia caregivers find themselves in, and to explore opportunities to improve their lives. **PART I** assesses aspects of the current situation, and **PART II** explores future directions to improve the caregivers' lives.

PART I Positive aspects of the current (neuro)psychological situation of informal dementia caregivers

Chapter 2 examines one of the relatively overlooked positive consequences of informal dementia caregiving: heightened caregiver self-esteem. A prediction model, including both non-modifiable and modifiable predictors, examining which factors predict heightened self-esteem is outlined in this chapter. *Chapter 3* examines how informal dementia caregivers score on tasks for memory and executive functioning, when taking their age, educational level, and sex into account. Whether cognitive performance can be predicted by several psychological variables is also assessed in this chapter.

PART II Exploring opportunities to improve the caregivers' lives

Recent interventions for informal caregivers have aimed to heighten empathy in order to lower burden and depression, because higher levels of empathy in professional caregivers have been found to be associated with better outcomes for both patient and professional caregivers.⁴⁸⁻⁵⁰ However, for informal caregivers, this link has not been thoroughly researched. To explore whether, and how, empathy is linked to burden, depression, and anxiety, *Chapter 4* examines this relationship in both caregivers and non-caregivers. Many interventions for caregivers have been developed over the past decade. However, none of the interventions to date have used experiential learning to increase understanding and empathy for people with

dementia, to ultimately enhance the well-being of informal caregivers. *Chapter 5* provides a protocol for a longitudinal study, in which the effectiveness of the mixed virtual reality training Into D'mentia will be tested. This training was developed in 2010 with the goal to allow the caregiver to experience what it is like to live with dementia.⁶¹ The training's primary aim is to increase the caregivers' empathy and understanding for people with dementia, to ultimately decrease caregiver burden and improve their well-being. *Chapter 6* provides the evidence regarding the effectiveness of the Into D'mentia training, at both group- and individual level. Finally, a comprehensive meta-analysis is presented in *Chapter 7* on the current evidence of the effectiveness of a full range of psychological interventions for informal dementia caregivers. Separate meta-analyses are provided for six outcome variables. Meta-regressions are employed to examine if there are intervention characteristics contributing to larger effects. To conclude this dissertation, a summary of the main findings is presented in a discussion in *Chapter 8*. Moreover, directions for future research, and implications for clinical practice are provided.

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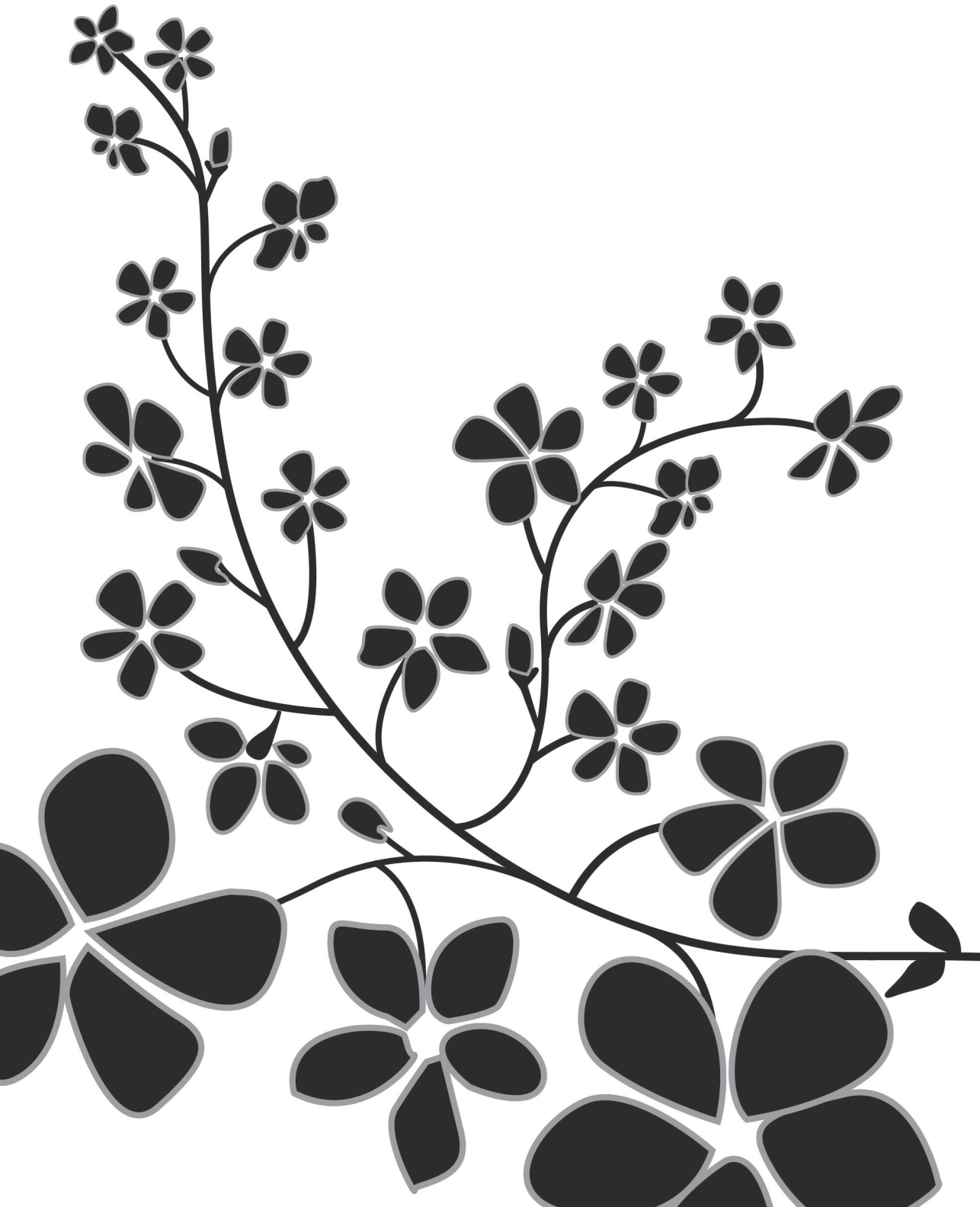
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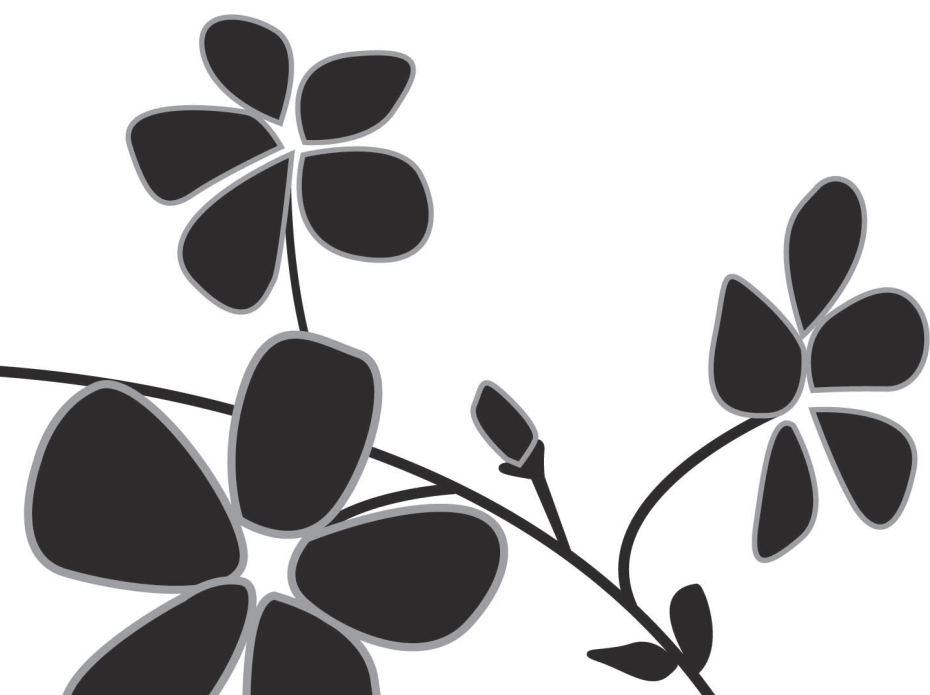
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PART I

POSITIVE ASPECTS OF THE CURRENT (NEURO)PSYCHOLOGICAL
SITUATION OF INFORMAL DEMENTIA CAREGIVERS



CHAPTER 2

PREDICTING SELF-ESTEEM IN INFORMAL CAREGIVERS OF PEOPLE
WITH DEMENTIA: MODIFIABLE AND NON-MODIFIABLE FACTORS

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ABSTRACT

Objectives: While informal caregivers often feel burdened by the care for a person with dementia, they can also experience positive consequences due to caregiving; caregiver gains. One of these relatively overlooked caregiver gains is heightened self-esteem. We assessed the predictive ability of non-modifiable (caregiver sociodemographic and dementia-related factors) and modifiable (psychological) factors for caregiver self-esteem.

Method: A cross-sectional study in which 201 caregivers, who spent at least eight hours a week on caring for a community-residing person with dementia, completed a semi-structured interview and five questionnaires. One two-block (1: non-modifiable variables and 2: modifiable variables) hierarchic multivariable regression analysis was used to assess which variables predicted self-esteem.

Results: None of the non-modifiable variables significantly predicted self-esteem. Regarding the modifiable variables, depression and relationship quality with the person with dementia significantly predicted self-esteem (adjusted $R^2 = .460$, $\beta = -.207$, $p = .015$ and $\beta = .632$, $p < .001$ respectively).

Conclusion: Caregivers who experience a better relationship quality with the person with dementia, and fewer depression symptoms, experience a higher level of self-esteem. Interventions focused on heightening self-esteem could strive to optimize these factors to enhance the lives of informal dementia caregivers.

INTRODUCTION

The prevalence of dementia is rising, with an estimated number of 131.5 million people living with dementia in 2050 worldwide.¹ Most people with dementia live at home and are dependent on informal caregivers, typically unpaid spouses, children, or other relatives, for most of their daily care. The literature has primarily focused on the negative consequences of informal caregiving: caregivers are thought to be more depressed and anxious than non-caregivers. In addition, they can experience caregiver burden, a multidimensional response to the various stressors associated with the caregiving experience.² However, some caregivers (also) experience positive consequences of caregiving, which a growing body of literature is beginning to acknowledge. These positive consequences are often called caregiver gains. Focus on this positive side of caregiving is warranted because these aspects might help buffer against caregiver burden,³ and negative affect,⁴ and in turn reduce the likelihood that the person with dementia will be institutionalised.^{5,6} Furthermore, focussing on the positive side of caregiving could lead to a more positive caregiving experience overall,⁷ and needs to be considered in order to obtain a more comprehensive view of caregiving.⁸ The lack of information on the positive consequences and the general focus on the negative, distorts how the caregiving experience is perceived and as such limits research in the field.⁹

To date there is no single, accepted definition for the concept of caregiver gains.¹⁰ Gains have primarily been operationalized in terms of caregiver self-report, and have included satisfaction with the caregiver role, the feeling of being appreciated or needed, spirituality, rewards, finding meaning in life, enrichment events in daily life, quality of the caregiver/person with dementia relationship, feelings of accomplishments, well-being, and resilience.¹⁰⁻¹² Due to these differences in conceptualization, gains have been operationalized differently across studies as well. Gains have been subjectively measured using self-report questionnaires assessing specific aspects of the concept¹² or via open-ended questions in interviews.

Self-esteem is the extent to which one values, approves, or likes oneself¹³ and is, to date, a relatively overlooked variable in informal caregiver research. Self-esteem has been found to positively correlate with well-being and to negatively correlate with caregiver burden,^{14,15} but has primarily functioned as a moderator or predictor variable in caregiver research¹⁴⁻¹⁶ instead of the outcome variable of interest. However, since self-esteem predicts success and well-being,¹⁷ and given that caregiving can affect the way caregivers value themselves,¹⁸ it is important to pay more attention to self-esteem in the caregiver literature. In order to explore this aspect in more detail and broaden the definition of caregiver gains, the current study focused on self-esteem as a measure of caregiver gains.

Several studies have examined predictive factors for gains, but the results to date are inconclusive. This ambiguity is likely due to differences in how gains have been conceptualized

and measured, differences in study populations, and differences in which predictors have been included in the analyses.¹⁹ Identified caregiver psychosocial and psychological predictors so far include more socio-emotional support;^{20,21} less experienced (subjective) burden;²² better mental well-being of the caregiver;²³ a higher quality premorbid relationship with the person with dementia;²⁴ and a higher intrinsic motivation for caregiving.²⁵ In addition, some caregiver sociodemographic and care-related predictors have been identified, including having a consanguinity relationship with the person with dementia,²² and more hours spent on care.²⁵ However, most of these predictors have been explored using only one specific aspect of gains, and some studies have relied on correlational (univariate) methods to investigate which factors are associated with gains,²⁶ and univariate analyses do not allow for identification of which predictors are most important. It remains unknown whether there are psychosocial (modifiable) predictors which predict gains irrespective of sociodemographic (non-modifiable) characteristics. Conceptualizing factors as modifiable and non-modifiable is important from a clinical and intervention perspective, because modifiable risk factors are amenable to interventions.²⁷ If modifiable predictors for self-esteem are known, interventions could target these to improve the lives of the caregivers, and indirectly the lives of the people with dementia.²⁸ Although non-modifiable factors may not be useful as targets for interventions, these are important in order to identify caregivers who experience fewer (or more) gains.²⁹

The present study aimed to identify (modifiable) psychological variables predicting caregiver gains (operationalized as self-esteem) while controlling for (non-modifiable) sociodemographic and dementia-related variables (time since diagnosis, and the time spent on caregiving by the caregiver). We hypothesized that more social support and less burden would predict more self-esteem. We also tested the predictive ability of depression, anxiety, and relationship quality with the person with dementia for caregiver gains. The modifiable variables depression and anxiety were chosen because these are the two most common complaints of caregivers;³⁰ relationship quality was selected because this is found to have a significant impact on caregivers' well-being,³¹ caregivers' physical and mental health,³² and on the symptoms of the person with dementia.³³

DESIGN AND METHODS

Study design

The current cross-sectional study used the baseline data of a larger, ongoing study. The protocol for the entire study³⁴ explains the method in greater detail.

Participants

All participants were adult informal caregivers who spent at least eight hours per week on care for a relative, spouse, or friend with dementia who lived at home (not institutionalized). They were not prohibited from having a case manager (which is considered to be usual care in the Netherlands). The participants were recruited from de Wever in Tilburg, the Netherlands, an organization for eldercare; elderly federations; Alzheimer Nederland; case managers; centers for daytime activities for people with dementia; private and professional networks of the researchers, and via social media.

Measures

Dependent variable - Self-esteem

Self-esteem was assessed using the Caregiver Reaction Assessment - Dutch (CRA-D), subscale Self-esteem.³⁵ The CRA-D is a self-report questionnaire designed to assess both the negative and positive consequences of caregiving. The subscale Self-esteem consists of seven statements (Cronbach's $\alpha = .791$). The subject reports to what extent he/she agrees with the statements on a 5-point scale (1 - 5). The scores were added up and divided by the number of items. Higher scores indicate higher levels of self-esteem (max. score = 5).

Predictors - Non-modifiable predictors

The caregiver sociodemographic factors were age (in years), sex, level of education according to Verhage (recoded into low, medium and high),³⁶ the type of relationship with the person with dementia (spouse/child/other), and whether or not the caregiver and the care receiver lived together. The dementia-related factors were the time since diagnosis (in years) and the time providing care a week (in hours).

Predictors - Modifiable predictors

Social support was measured using the Dutch version of the Inventory for Social Reliance (ISR) - qualitative part.³⁷ There are 11 items (Cronbach's $\alpha = .888$), each rated according to a 4-point Likert scale (1 - 4). A total score was calculated by adding up all items; higher scores indicate more social support (max. score = 44).

The current quality of the relationship between the caregiver and the person with dementia was assessed using the Relationship Quality Index (RQI),³⁸ consisting of five questions which can be answered on a 7-point Likert scale (1 - 7) (Cronbach's $\alpha = .938$). The maximum score is 35. Higher scores indicate a higher relationship quality.

Depression and anxiety were measured using the Hospital Anxiety and Depression Scale (HADS), subscale Depression and Anxiety respectively.³⁹ The HADS is a self-report questionnaire consisting of 14 items; seven for each subscale (Cronbach's $\alpha = .848$ for the subscale Depression and $\alpha = .851$ for the subscale Anxiety). The responses are based on the relative frequency of symptoms over the past week, using a 4-point Likert scale ranging from 0 (not at all) to 3 (very often). The maximum scores for both scales are 21; higher scores indicate more depression/anxiety symptoms.

Caregiver burden was assessed using the CRA-D,³⁵ subscales Financial Problems (three items, Cronbach's $\alpha = .898$), Impact of caregiving on disrupted schedule (five items, Cronbach's $\alpha = .845$), Lack of family support (five items, Cronbach's $\alpha = .821$), and Health problems (four items, Cronbach's $\alpha = .799$). The participant reports to what extent they agree with the statements on a 5-point scale (1 - 5). The scores were added up per subscale, and divided by the number of items composing the subscale (max. score for each subscale = 5). Higher scores on these subscales indicate higher burden.

Procedure

Potential participants received oral and written information about the study from case managers, nurses, and supervisors at day-time activity centers, or only written information on social media. The participants were invited to contact the researchers (LJ) by phone or e-mail if they had questions and to receive more information about the study. If they were interested in participating, the appointment for the semi-structured interview was scheduled and the questionnaires were sent. The interviews consisted of questions about sociodemographic information and the dementia-related information, and were conducted by trained neuropsychologists. During the interviews the participants received help with the questionnaires if needed. The interviews took place either at Tilburg University or at the participants, home; depending on their preference. Written informed consent was obtained from the caregivers (the people with dementia did not take part in the study) and the study protocol has been approved by the local ethics committees.

Power analysis

The sample size needed was calculated with G*Power. Based on an alpha level of .02, a power of .80, and 17 predictors, at least 175 participants were needed to detect medium ($f^2 = .15$) effects.

Statistical analyses

Statistical analyses were performed using SPSS Statistics 22.⁴⁰ Descriptive statistics and frequencies were used to describe the study sample. One hierarchical multivariable regression analysis, consisting of two blocks was performed: Block 1: (non-modifiable) sociodemographic and dementia-related variables; Block 2: (modifiable) caregiver psychological variables. Within the blocks, the forced entry method was used to reduce the influence of random variation in the data and increase the replicability of the results.⁴¹ To adjust for multiple comparisons, the alpha level was restricted to .02.

RESULTS

Two hundred and one caregivers completed the questionnaires and semi-structured interviews. The mean age of the caregivers was 61; the majority were female (79%), with a high level of education (49%), and most cared for their spouse or parent (41% and 45% respectively). The mean age of the people with dementia was 79 and most (58%) were diagnosed with Alzheimer's disease. An overview of the sociodemographic characteristics, and scores on dependent and predictor variables can be found in Table 1.

Table 1 Participant characteristics ($n = 201$), and scores on modifiable and non-modifiable factors

| Caregiver sociodemographic variables | | |
|--|--------|-------------|
| Age | | 60.8 ± 12.0 |
| Male sex | | 43, 21.4% |
| Level of education ^a | Low | 30, 14.9% |
| | Medium | 72, 35.8% |
| | High | 99, 49.3% |
| Relationship with the person with dementia | Spouse | 82, 41.0% |
| | Child | 90, 45.0% |
| | Other | 29, 14.0% |
| Cohabiting with the person with dementia, %yes | | 78, 38.8% |
| Caregiver psychological variables | | |
| CRA - Self-esteem ^b | | 3.8 ± 0.6 |
| CRA - Financial problems ^b | | 2.4 ± 0.7 |
| CRA - Impact of caregiving on disrupted schedule ^b | | 3.0 ± 0.9 |
| CRA - Lack of family support ^b | | 2.4 ± 0.8 |
| CRA - Health problems ^b | | 2.5 ± 0.9 |
| ISR ^c | | 30.1 ± 6.5 |
| RQI ^d | | 26.7 ± 6.9 |
| HADS - Depression ^e | | 5.0 ± 4.0 |
| HADS - Anxiety ^e | | 6.6 ± 4.0 |
| Person with dementia characteristics and dementia-related variables | | |
| Age | | 78.6 ± 8.3 |
| Male sex | | 87, 43.3% |
| Dementia diagnosis | AD | 116, 57.7% |
| | VaD | 35, 17.4% |
| | PD | 4, 2.0% |
| | Other | 15, 7.5% |
| | NDD | 31, 15.4% |
| Hours providing care a week | | 56.0 ± 63.1 |
| Time since diagnosis in years | | 3.1 ± 2.5 |

Note. Values presented as $M \pm SD$; or $n, \%$.

AD, Alzheimer's Disease; CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; ISR, Inventory for Social Reliance; NDD, no differential diagnosis; PD, Dementia associated with Parkinson's Disease; RQI, Relationship Quality Index; VaD, Vascular Dementia.

^aEducational level, according to Verhage;³⁶ recoded into low (1 - 4); medium (5); and high (6 - 7). ^bscore range 1 - 5; ^cscore range 11 - 44; ^dscore range 5 - 35; ^escore range 0 - 21.

Preliminary analyses were conducted to ensure no violations of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. The sociodemographic variable 'cohabiting with the care receiver' was dropped from the regression analysis because the correlation with the variable 'type of relationship with the care receiver' was too high ($\chi^2(2) = 171,270, p < .001$), causing multicollinearity.

The results of the regression analysis are given in Table 2. In Model 1, the non-modifiable (sociodemographic and dementia-related) variables were entered. None of the variables were found to be significant predictors, and the model as a whole only explained 5% of the variance in caregiver self-esteem. In Model 2, the modifiable variables were entered. This model explained 51% of the variance, $F(16, 162) = 10.487, p < .001$. In this model, the variables relationship quality with the person with dementia and depression were statistically significant ($\beta = .621, p < .001$, and $\beta = -.207, p = .015$ respectively).

Table 2 Results of the hierarchical multivariable regression analysis predicting self-esteem ($n = 201$)

| Predictor | Model 1 | | | Model 2 | | |
|---|----------|-------------|---------|----------|-------------|---------|
| | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β |
| Constant | 3.33 | 0.35 | | 2.14 | 0.40 | |
| Age | 0.01 | 0.01 | .158 | 0.01 | 0.01 | .082 |
| Sex (0 = female, 1 = male) | 0.11 | 0.12 | .076 | 0.07 | 0.07 | .048 |
| Level of education ^a - Low | -0.02 | 0.14 | -.015 | -0.12 | 0.11 | -.074 |
| Level of education ^a - High | 0.02 | 0.10 | .014 | -0.07 | 0.07 | -.060 |
| Relationship with person with dementia - Spouse | -0.28 | 0.18 | -.240 | -0.18 | 0.14 | -.155 |
| Relationship with person with dementia - Child | 0.11 | 0.14 | .092 | -0.03 | 0.10 | -.027 |
| Hours providing care a week | 0.01 | 0.01 | .022 | 0.01 | 0.01 | .035 |
| Time since diagnosis | -0.01 | 0.02 | -.012 | 0.01 | 0.01 | .030 |
| Social support | | | | 0.01 | 0.01 | .033 |
| Relationship quality | | | | 0.04 | 0.01 | .621** |
| Depression | | | | -0.03 | 0.01 | -.207* |
| Anxiety | | | | 0.01 | 0.01 | .043 |
| Burden - Financial problems | | | | -0.02 | 0.05 | -.028 |
| Burden - Impact of caregiving on disrupted schedule | | | | 0.07 | 0.06 | .102 |
| Burden - Lack of family support | | | | 0.05 | 0.05 | .067 |
| Burden - Health problems | | | | -0.05 | 0.07 | -.074 |
| Total R^2 | | 0.05 | | | 0.51 | |
| Adjusted R^2 | | 0.01 | | | 0.46 | |
| Total F | | 1.11 | | | 10.49** | |
| ΔR^2 | | | | | 0.46** | |
| ΔF | | | | | 18.93** | |

Note. The variable 'cohabiting with the care receiver' was dropped from the analysis, because the correlation with the variable 'Relationship with the person with dementia' was too high ($p < .001$), causing multicollinearity.

^aEducational level, according to Verhage;³⁶ recoded into low (1 - 4); medium (5); and high (6 - 7); medium was the reference category.

* $p < .02$, ** $p < .001$.

DISCUSSION

This study explored the predictive ability of non-modifiable (caregiver demographic and dementia-related) and modifiable (caregiver psychological) factors for caregiver gains, operationalized as caregiver self-esteem.

None of the non-modifiable variables significantly predicted self-esteem. Regarding the modifiable predictors, relationship quality and depression symptoms were found to be predictive of self-esteem. The finding regarding relationship quality is in line with a systematic review,³¹ which found that the caregiver's perception of current relationship quality may have an impact not only on both the caregivers' and person with dementia's well-being, but also on the caregivers' ability to continue caregiving. In addition, relationship quality has been found to predict caregiving satisfaction^{24,42} in informal dementia caregivers. Furthermore, in general, rewarding aspects of relationships are found to be positively related to self-esteem,⁴³ which we used as measure of caregiver gains. The finding regarding depression is in line with a previous study,³ which found that positive feelings about caring were associated with lower depression scores. Beyond the scope of caregiving research, a meta-analysis⁴⁴ also found that depression and self-esteem are strongly related. The direction of this relationship, i.e. whether depression leads to low self-esteem, or vice versa, is not yet known.

In contradiction with our hypothesis and previous research,²² that gains would be predicted by burden, none of the subscales predicted self-esteem. These contradictory findings can be explained by the fact that we used different conceptualizations of gains than de Labra et al.²² De Labra et al.²² operationalized caregiver gains as caregiver satisfaction, and measured it with the Caregiver Satisfaction Scale. While this questionnaire does include one item related to caregiver self-esteem, this scale is very different from our operationalization of caregiver gains. Another explanation lies in the measures used for burden. De Labra et al.²² used one total score (from the Zarit Burden Interview) to measure burden, while we focused on the separate subscales of the CRA-D. Future research could focus on exploring these different conceptualizations and operationalizations of burden and gains and the associated predictors for both.

Contrary to our hypothesis, and to other studies which found that social support was highly correlated²⁶ and an important predictor for gains,^{20,21} we did not find that more social support predicted self-esteem. Explanations for these contradictory findings lie in the measures used for either social support and/or gains. We measured general social support, while Shirai et al.²⁰ specifically identified partner social support (not from friends) as a positive predictor. Shirai et al.²⁰ suggested that family members are more likely to share caregiving standards and values with the caregivers than friends, which helps them to provide meaningful social support. This gives caregivers confidence and a sense of appreciation in their caregiver role,

which leads to greater feelings of gain. Conversely, contact with friends may also remind the caregiver of missed and limited social opportunities due to their caregiver role.²⁰ However, Cheng et al.²¹ did find that aspects of general social support (network size, and positive social exchanges) significantly predicted gains. Cheng et al.²¹ measured gains using the Positive Aspects of Caregiving survey, which focusses on self-affirmation and outlook on life, which are different from our operationalizations of gains. Future gains-research should therefore consider who provides the support, and which aspect of gains to measure.

There were some limitations. The study was cross-sectional in design making it impossible to talk about cause-effect relationships. Secondly, the dependent variable was measured using the CRA-D. While this is a validated questionnaire, it is not specifically designed to measure the broad concept of caregiver gains, but to measure a certain aspect of it. As a consequence, our results cannot be compared with studies measuring other aspects of gains without reservations.

Implications and conclusion

A more comprehensive definition for gains encompassing multiple aspects is needed and future research into gains should include a number of different aspects of gains. Ideally, future research should look into developing a questionnaire encompassing multiple aspects of gains to allow comparisons across studies and assist in replication of findings. It is likely that different aspects of gains have different predictors. Clinical practice with informal dementia caregivers should however be alerted to the fact that caregivers can experience gains and not only focus on the negative consequences.

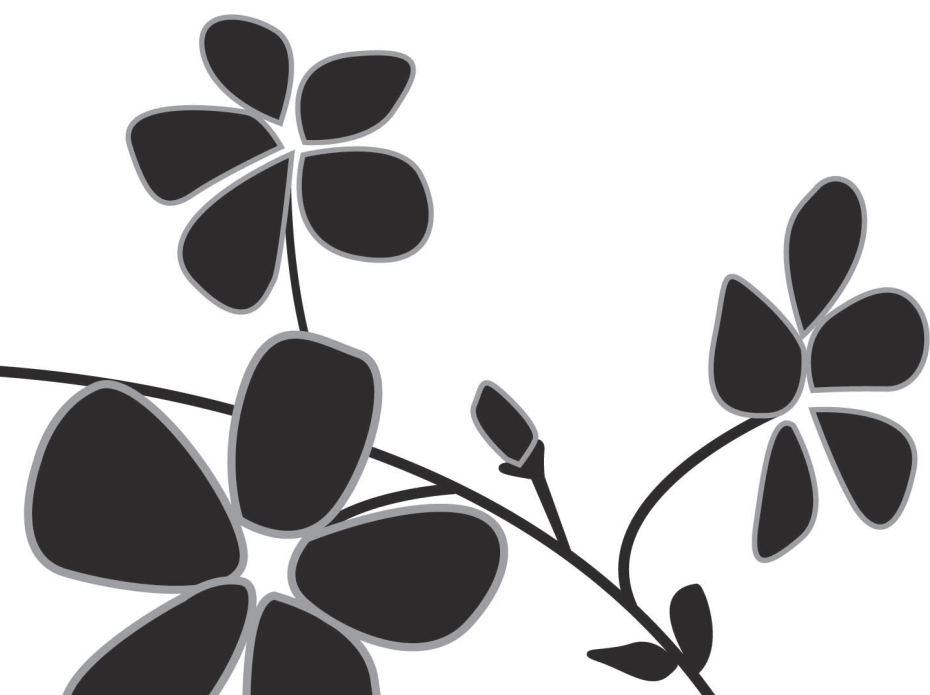
In conclusion, caregiver gain is an important, and still relatively under-researched concept. A positive approach is warranted because not all caregivers experience negative consequences and focusing on this positive side may lead to a more affirmative experience overall. Our results suggest that a better quality of the relationship with the person with dementia and fewer depression symptoms are predictive of self-esteem, irrespective of sociodemographic characteristics. Interventions for caregivers could try to focus on enhancing relationship quality and on reducing symptoms of depression. This may lead to a higher level of self-esteem which could ultimately improve the lives of both the caregiver and the person with dementia.

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CHAPTER 3

EPISODIC MEMORY AND EXECUTIVE FUNCTIONING
IN INFORMAL DEMENTIA CAREGIVERS

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ABSTRACT

Objectives: Informal dementia caregivers are thought to experience high levels of depression and burden, which can contribute to worse cognitive functioning. However, worse cognitive functioning in caregivers is not always found. The current study explored whether caregivers perform better, worse, or similar to non-caregivers on tasks for executive functioning and memory. Whether sociodemographic and psychosocial characteristics are associated with caregivers' performance was also assessed.

Methods: One hundred forty-five caregivers completed the Letter Fluency and Category Fluency, the Logical Memory test from the WMS-III, and five questionnaires assessing psychological characteristics. Standardized z-scores (on age, education, and sex) were calculated using data from a matched control group (187 non-caregivers). One sample z-tests were executed to examine if the caregivers' standardized mean z-score significantly deviated from the population mean of $z = 0$. Subsequently, the z-scores were used as dependent variables in multivariable regression analyses.

Results: The caregivers performed significantly better on Logical Memory - Immediate Recall than non-caregivers ($z = 2.92, p = .004$). The obtained z-scores on the other tasks did not deviate significantly from 0. Male sex and social reliance predicted higher scores on Category Fluency, but the F -test was non-significant, and the explained variance was low (adjusted $R^2 = .068$).

Conclusions: We found no evidence for worse cognitive performance among informal caregivers. We found that caregivers perform better than or similar to non-caregivers on cognitive tasks when age, educational level, and sex are taken into account. We argue that policy reports and research articles should present a more balanced and comprehensive view of the current state of caregiving research including both positive and negative aspects.

INTRODUCTION

Approximately 131.5 million people in the world will have some form of dementia by 2050.¹ Most of these people live at home and depend on informal caregivers, mostly unpaid spouses, children, or other relatives, for their daily care.

Informal caregivers can experience negative consequences, including increased depression and caregiver burden due to their caregiving responsibilities.^{2,3} In addition, previous research showed that caregivers performed significantly worse than non-caregivers on neuropsychological tasks.⁴⁻¹⁰ A possible explanation for poorer cognitive functioning is that caregiving has been associated with high stress levels which has been assessed both subjectively (questionnaires) and objectively (elevated cortisol levels).¹¹ The stress hormone cortisol is able to cross the blood-brain barrier, and since the hippocampus and the prefrontal cortex are vulnerable to the impact of stress due to the dense concentration of cortisol receptors in these brain areas,¹² this could subsequently lead to impaired memory and executive functioning. In fact, it has been found that stress may mediate the relationship between caregiving and deficits in cognitive functioning.^{5,8,9,13} In addition, caregivers are thought to have elevated rates of depression,¹⁴ and anxiety,¹⁵ which are possibly related to higher cortisol levels,^{16,17} and fewer social contacts,¹⁸ all of which may contribute to poorer cognitive functioning.¹⁹

Poorer caregiver cognitive functioning can have a detrimental impact on the lives of both the caregiver and the care receiver. Even mild problems with memory and executive functioning can affect the caregivers' ability to provide adequate care which can subsequently affect the quality of life of both members of the dyad.^{4,14} In addition, when the caregiver can no longer provide care, the likelihood that the person with dementia will be institutionalized rises.²⁰ Therefore, it is important to know whether or not caregivers have worse memory and/or executive functioning than can be expected for their age. If this, and the associated sociodemographic, psychosocial, and psychological factors are known, policy around dementia care could be informed and targeted interventions to enhance the caregivers' cognitive functioning could be developed.

However, cognitive impairment in caregivers is not always found. For example, Pertl et al.²¹ found no differences between 179 spousal dementia caregivers and 179 non-caregivers on 11 cognitive tasks. O'Sullivan et al.²² found that the performance of 252 spousal dementia caregivers and non-caregivers did not differ on tests for immediate memory, delayed memory, and shifting attention, while the caregivers significantly outperformed non-caregivers on tests assessing reaction time, processing speed, and free recall. The healthy caregiver hypothesis suggests that factors related to caregiving, such as physical and cognitive caregiving demands, may serve to protect caregivers from stress and help to maintain their (cognitive)

health as they age.²³⁻²⁷ Proponents of this hypothesis claim that positive aspects associated with caregiving may explain better cognitive functioning among caregivers.²⁸ They argue that caregivers would be more motivated to preserve their health,²² and that the physical activities associated with caregiving could lead to better caregiver (cognitive) health.²⁸

These contradictory findings can (partly) be explained by differences in sociodemographic characteristics between study samples.²¹ For instance, Pertl et al.²¹ found that caregiving was only related to worse cognitive functioning in male (not female) caregivers. In addition, most studies assessed only spousal caregivers (excluding child-caregivers). Spousal caregivers are thought to be at risk for cognitive impairments due to their age, and because they share certain risk factors for dementia with their spouse, such as socio-economic status, and associated behaviors like diet.^{19,29} Estimations of impaired cognitive functioning might therefore not be generalizable to the entire caregiver population. O'Sullivan et al.²² and Roth et al.³⁰ hypothesized that different findings may stem from different recruitment strategies: caregivers are generally recruited using dementia services and may therefore over-represent those reporting more burden.^{2,31} Non-caregivers on the other hand are typically recruited through (social) media, active retirement and social groups, and therefore tend to be socially active volunteers who are typically healthier than the general population.³² The disparity in performance between caregivers and non-caregivers can stem from these recruitment differences rather than from actual differences between the groups. Another explanation for the mixed findings of previous studies lies in methodological issues. Overall, studies which reported poorer cognitive functioning in caregivers were typically older and had small sample sizes (n between 16 and 56), while the more recent studies of Pertl et al.²¹ and O'Sullivan et al.²² did not find worse cognitive functioning and used larger samples (n between 179 and 252). Also, the studies used different covariates in the analyses. Although neuropsychological tasks are known to be influenced by age, educational level, and (to a lesser extent) sex,³³ not all studies used standardized scores or controlled for these covariates. This hinders interpretation and comparison of findings.

This study examined if informal dementia caregivers performed worse, better, or similar to non-caregivers on tests for executive functioning and memory when controlling for age, educational level, and sex. In addition, whether sociodemographic and/or psychological variables predicted standardized scores on the cognitive tasks was also explored. We hypothesized that caregivers would perform worse on cognitive tests than non-caregivers, because most of the previous findings point to that direction. In addition, we hypothesized that more depressive symptoms and burden predict worse cognitive performance.

METHOD

Study design

The current study used the baseline data of a larger intervention study, complemented with a control group, and neuropsychological tests. The protocol for the larger study³⁴ explains the method and procedure in greater detail.

Participants

Participants were 145 adult (18+) self-identified informal caregivers, who spent at least eight hours per week on care for a relative, spouse, or friend with dementia who lived at home. Caregivers of institutionalized patients were excluded. In order to overcome the above-described methodological issues of previous research and to enhance generalizability, all caregivers were included instead of only spouses. Table 1 provides an overview of the demographic and psychological characteristics of the participants. Neither the people with dementia nor their caregivers were prohibited from usual care; all had access to a case manager, who usually assists with practical and personal difficulties, and all had the opportunity to join regular information and support groups. Caregivers were recruited via a variety of ways instead of only through dementia services in an attempt to obtain a more representative sample of the caregiver population; via (social) media, case managers, supervisors at day-time activity centers, and other health organizations and professionals like physiotherapists, and medical podiatrists.

To standardize the neuropsychological test-scores employing regression-based norming, a matched control group (on age, sex, and educational level), of 187 adult non-caregivers, was recruited. The control group was recruited from the same type of organizations, health professionals, and (social) media. Both group-matching and stratification by cluster (age, sex, and educational level) were applied to ensure comparability of the groups. Regression-based norming was applied instead of published norms, because the existing norms for the used cognitive tasks were collected over a decade ago and therefore may be outdated. Ageing of norms is an important threat to the usefulness of normative data.³⁵ In addition, the Dutch norms for Letter Fluency were based only on education, the norms for Category Fluency on age and education, and the norms for the WMS-III are based on data from Americans instead of Dutch persons.³⁶ Because of these (potential) shortcomings, we used the data of the control group to standardize the scores.

Table 1 Demographics and psychosocial characteristics of the informal caregivers and control participants

| | | Informal caregivers (<i>n</i> = 145) | Control participants (<i>n</i> = 187) | Test-value ^a | <i>p</i> -value |
|--|--------|--|---|-------------------------|-----------------|
| Sociodemographic characteristics | | | | | |
| Age | | 59.6 ± 11.9 | 58.6 ± 13.4 | 0.658 | .511 |
| Male sex | | 30, 21% | 55, 29% | 3.362 | .077 |
| Level of education | Low | 23, 16% | 31, 17% | 0.172 | .917 |
| | Middle | 52, 36% | 63, 33% | | |
| | High | 70, 48% | 93, 50% | | |
| Relationship with care receiver | Spouse | 52, 36% | | | |
| | Child | 67, 46% | | | |
| | Other | 26, 18% | | | |
| Cohabiting with care receiver (<i>n</i> , % yes) | | 46, 32% | | | |
| Hours spent on care a week | | 47.2 ± 60.1 | | | |
| Time since dementia diagnosis (in years) | | 3.6 ± 2.6 | | | |
| Psychological symptoms and psychosocial characteristics | | | | | |
| HADS - Anxiety | | 6.2 ± 3.8 | 5.0 ± 3.3 | 2.899 | .004** |
| HADS - Depression | | 4.8 ± 4.2 | 3.6 ± 2.8 | 3.011 | .003** |
| CRA | | 57.6 ± 11.4 | | | |
| RQI | | 31.6 ± 7.9 | | | |
| ISR | | 30.7 ± 5.3 | 32.1 ± 5.1 | -2.194 | .029* |
| SSCQ | | 27.3 ± 5.0 | | | |

Note. Values presented as *M* ± *SD*; or *n*, %. The CRA, RQI, and SSCQ were relevant for caregivers only. CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; ISR, Inventory for Social Reliance; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

^aTest-values were *t*-values for continuous variables and χ^2 for categorical variables.

p* < .05, *p* < .01.

Power analysis

G*Power was used to determine the needed sample size. Regarding the z-tests, 128 caregivers were needed to detect small to medium effects (*d* = 0.25), based on an alpha of .05, and a power of .80. For the regression analyses, 135 caregivers were needed to detect medium effects (*f*² = 0.15), based on an alpha of 0.05, a power of .80 and 14 predictors. To standardize the scores, we aimed to recruit the same number of participants for the control group.

Measures

Sociodemographic characteristics

The caregivers' neuropsychological test-scores were standardized for age, sex, and educational level using regression-based norms (see below). The highest completed educational level was determined using the classification system of Verhage,³⁹ self-reported by the participants during the semi-structured interviews. This system's seven categories were merged into three ordinal categories; low (1 - 4), middle (5), and high (6 - 7) educational level. Relationship with the care receiver (spouse, child, other), the number of hours spent on care a week, and the time since the dementia diagnosis of the care receiver in years were also examined. Information regarding these variables was self-reported by the caregivers during the semi-structured interviews.

Neuropsychological tests

Wechsler Memory Scale-III (WMS-III) Logical Memory; Immediate Recall and Retention. These tests were chosen to measure episodic memory. Trained interviewers read two separate stories out loud to each participant. The participant was then required, immediately after each story, and at a 20 minute delay, to verbally recall all they could remember. One immediate recall score was calculated for each participant as the total number of correct items given for both stories. The %retention (i.e. correct items on delayed recall), relative from their immediate recall score for that story, was calculated for the retention score.³⁶

Letter Fluency and Category Fluency. These tests were chosen as measures of executive functioning. The participants were instructed to verbally generate words beginning with the D, A, and T in three separate 60 second trials for Letter Fluency.³⁷ Names and numbers were considered incorrect. The number of correct responses was added up across the three trials, to one total score. For Category Fluency, the participants were instructed to verbally generate words in two categories (animals and professions) in two separate, 60 seconds trials.³⁸ The numbers of correct responses were added up across the two trials, to one total score.

Questionnaires assessing psychological symptoms and psychosocial characteristics.

Symptoms of depression and anxiety were measured using the Hospital Anxiety and Depression Scale (HADS) subscale Depression and Anxiety respectively.⁴⁰ The HADS is a self-report questionnaire consisting of 14 items; seven for each subscale (Cronbach's $\alpha = .784$ for the subscale Depression and $\alpha = .792$ for the subscale Anxiety in this study). The responses are based on the relative frequency of symptoms over the past week, using a 4-point Likert scale ranging from 0 (not at all) to 3 (very often). The maximum score for both scales is 21; higher scores indicate more depression/anxiety symptoms. For both scales, the cut-off value indicating mild depression/anxiety symptoms is 8, and scores of 15 and higher indicate severe symptoms.

Social reliance was measured using the Dutch version of the Inventory for Social Reliance (ISR) - qualitative part.⁴¹ There are 11 items (Cronbach's $\alpha = .863$), each rated according to a 4-point Likert scale (1 - 4). A total score (max. score = 44) was calculated by adding up all items; higher scores indicate more social support.

Caregiver burden was assessed using the Caregiver Reaction Assessment - Dutch (CRA-D).⁴² The caregiver reports to what extent he or she agrees with the 24 statements on a 5-point scale (1 - 5). The scores were added up to one total score, ranging from 24 to 120. Scores were recoded so that higher scores indicate more burden, Cronbach's $\alpha = .860$.

Caregiver's sense of competence was assessed by the Short Sense of Competence Questionnaire (SSCQ), which consists of seven items, rated according to a 5-point Likert scale (1 - 5). The items were summed, to a total score which ranges from 7 to 35,⁴³ Cronbach's $\alpha = .803$.

The quality of the relationship between the caregiver and the person with dementia was assessed using the Relationship Quality Index (RQI),⁴⁴ consisting of five questions which can be answered on a 7-point Likert scale (1 - 7) (Cronbach's $\alpha = .943$). The maximum score is 35. Higher scores indicate a higher relationship quality.

Procedure

All participants completed a semi-structured interview, including the neuropsychological tests, and a questionnaire booklet. The CRA-D, SSCQ, and the RQI were completed by the caregivers only because the questions are not applicable to non-caregivers. Likewise, the interview contained additional dementia-related questions for the caregivers. The interviews took place either at Tilburg University or at the participants, home; depending on their preference. Convenience sampling was used, where the participants could contact the researchers if they were interested in participating in the study. Written consent was obtained and the study protocol was approved by the local ethics committee.

Statistical analyses

The statistical analyses were performed using R software⁴⁵ and SPSS Statistics 22.⁴⁶ Descriptive statistics and frequencies were used to describe the groups, *t*-tests and chi-square tests were used to compare the groups on sociodemographic, psychological, and psychosocial variables.

To obtain sociodemographically adjusted z-scores for age, sex, and educational level, regression-based norming based on the control groups' scores was applied. To ensure the

groups were matched, both group matching and stratification by cluster were used (based on age (in clusters of 10 years), sex (two clusters), and educational level (three clusters)). These predictors were entered as a single block (forced entry), and the results of these regression models provided the formulae for computing the sociodemographically adjusted z-scores. All predictors were included in the normative formulae, irrespective of the significance of the effects. The results of these regression analyses and the resulting formulae are shown in Supplementary Table S1.

One sample z-tests, using the sociodemographically adjusted z-scores, were performed to examine if the caregivers' standardized mean z-score deviated from 0 (with a standard deviation of 1); the (expected) population mean.

To examine if the psychosocial characteristics or psychological symptoms described above predicted cognitive functioning, the standardized z-scores were used as dependent variables in multivariable linear regression analyses. To examine the additional predictive value of age, sex, and educational level, these variables were added in the regression analyses as well.

P-values lower than .05 were considered statistically significant. However, to adjust for multiple significance testing, the Benjamini-Hochberg procedure (false discovery rate, FDR) was applied.⁴⁷ This procedure is recommended for health-related studies.⁴⁸ The adjusted alpha levels were calculated and reported per analysis.

RESULTS

One hundred forty-five caregivers were included. On average they were 60 years old, 79% were female, 48% were highly educated, and most cared for their spouse (36%) or parent (46%), see Table 1. The control group consisted of 187 non-caregivers, who were on average 59 years old, 71% were female, and 50% were highly educated. The groups did not differ on these sociodemographic variables. While both groups scored on average below the cut-off of 8, the caregivers had significantly more anxiety symptoms ($M = 6.2$, $SD = 3.8$, versus $M = 5.0$, $SD = 3.3$, $p = .004$), and more depression symptoms ($M = 4.8$, $SD = 4.2$, versus $M = 3.6$, $SD = 2.8$, $p = .003$) than non-caregivers. The caregivers also had fewer social contacts ($M = 30.7$, $SD = 5.3$, versus $M = 32.1$, $SD = 5.1$, $p = .029$), than non-caregivers.

Table 2 shows the caregivers' raw scores, standardized z-scores, and results of the z-tests. Caregivers performed significantly better on both subtests of the WMS-III than the population mean of $z = 0$: Immediate Recall ($z = 2.92$, $p = .004$) and Retention ($z = 2.12$, $p = .033$). After adjusting for multiple comparisons, leading to an alpha level of .025, only the z-test for Immediate Recall remained significant. The caregivers' z-scores on both verbal fluency tests did not differ significantly from $z = 0$.

Table 2 Caregivers' z-scores and results of the z-tests for each neuropsychological test

| | Raw score | Mean standardized z-score | p-value z-test |
|--------------------------------|-------------|---------------------------|----------------|
| WMS - Logical Memory Immediate | 24.2 ± 6.9 | 2.92 | .004** |
| WMS - Logical Memory Retention | 90.3 ± 26.0 | 2.14 | .033* |
| Letter Fluency | 34.9 ± 11.0 | -1.96 | .050 |
| Category Fluency | 41.1 ± 10.8 | -0.08 | .932 |

Note. Raw scores presented as $M \pm SD$. Z-scores were adjusted for age, educational level, and sex based on the control group's scores. The adjusted alpha was .025, as calculated by the Benjamini-Hochberg procedure;⁴⁷ ($2/4 \times 0.05 = .025$).

WMS, Wechsler Memory Scale.

* $p < .05$, ** $p < .025$.

Table 3 shows the multivariable regression analyses predicting the z-scores for Logical Memory Immediate Recall and Retention. No significant predictors were identified. The F -tests for neither Immediate Recall nor Retention was significant, and the explained variance for both subtests was low; $R^2 = .087$ (adjusted $R^2 = <.001$), and $R^2 = .130$ (adjusted $R^2 = .020$) respectively.

Table 3 Multivariable regression analyses predicting the caregivers' z-scores on WMS-III Logical Memory

| Predictor | Logical Memory Immediate Recall | | | Logical Memory Retention | | |
|---|---------------------------------|---------|---------|--------------------------|---------|---------|
| | B (SE) | β | p-value | B (SE) | β | p-value |
| Age | -0.01 (0.01) | -.07 | .626 | -0.01 (0.01) | -.06 | .660 |
| Sex (0 = female, 1 = male) | 0.23 (0.24) | .09 | .342 | 0.23 (0.25) | .09 | .353 |
| Level of education - Low ^a | 0.32 (0.31) | .12 | .306 | 0.28 (0.32) | .10 | .373 |
| Level of education - High ^a | 0.23 (0.21) | .11 | .279 | -0.25 (0.21) | -.12 | .229 |
| Relationship with person with dementia - Spouse | 0.43 (0.41) | .21 | .306 | 0.12 (0.42) | .05 | .785 |
| Relationship with person with dementia - Child | 0.18 (0.27) | .09 | .519 | 0.18 (0.28) | .09 | .519 |
| Hours spent on care | -0.01 (0.01) | -.09 | .564 | -0.01 (0.01) | -.27 | .068 |
| Time since dementia diagnosis care receiver | 0.04 (0.04) | .10 | .307 | -0.01 (0.04) | -.01 | .982 |
| HADS - Anxiety | -0.03 (0.04) | -.12 | .381 | -0.05 (0.04) | -.19 | .147 |
| HADS - Depression | 0.03 (0.04) | .13 | .400 | 0.10 (0.04) | .41 | .009* |
| CRA | 0.01 (0.01) | .12 | .434 | 0.01 (0.01) | -.01 | .992 |
| RQI | -0.04 (0.02) | -.23 | .053 | 0.01 (0.02) | .07 | .592 |
| ISR | 0.01 (0.02) | .05 | .639 | 0.01 (0.02) | .07 | .536 |
| SSCQ | 0.01 (0.02) | .27 | .075 | -0.01 (0.03) | -.04 | .792 |
| R^2 | | .087 | | | .130 | |
| Adjusted R^2 | | <.001 | | | .020 | |
| F | | .756 | | | 1.185 | |

Note. Z-scores were adjusted for age, educational level, and sex. For Immediate Recall, the alpha level did not need correction, because none of the predictors was significant. For Retention, the adjusted alpha level was calculated by the Benjamini-Hochberg procedure,⁴⁷ leading to an alpha level of $(1/14 \times 0.05) = .004$.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; ISR, Inventory for Social Reliance; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire. ^aEducational level, according to Verhage,³⁹ recoded into low (1 - 4); medium (5); and high (6 - 7); medium was the reference category.

* $p < .05$, ** $p < .004$.

Table 4 shows the multivariable regression analyses predicting the z-scores on the fluency tasks. Male sex ($\beta = .260$, $p = .006$) and a higher score on the social reliance questionnaire ($\beta = .338$, $p = .002$) predicted higher scores on Category Fluency. For Letter Fluency no significant predictors were identified. The F -tests for both Category Fluency and Letter Fluency were non-significant, and the explained variance for both tasks was low: $R^2 = .172$ (adjusted $R^2 = .068$), and $R^2 = .151$ (adjusted $R^2 = .043$) for Category and Letter Fluency respectively.

Table 4 Multivariable regression analyses predicting the caregivers' z-scores on Category Fluency and Letter Fluency

| Predictor | Category Fluency | | | Letter Fluency | | |
|---|------------------------|---------|-----------------|------------------------|---------|-----------------|
| | <i>B</i> (<i>SE</i>) | β | <i>p</i> -value | <i>B</i> (<i>SE</i>) | β | <i>p</i> -value |
| Age | 0.01 (0.01) | .01 | .984 | 0.01 (0.01) | .09 | .545 |
| Sex (0 = female, 1 = male) | 0.73 (0.26) | .26 | .006** | 0.37 (0.20) | .17 | .073 |
| Level of education - Low ^a | 0.45 (0.34) | .15 | .186 | -0.37 (0.26) | -.16 | .154 |
| Level of education - High ^a | 0.18 (0.22) | .08 | .415 | -0.35 (0.17) | -.21 | .044* |
| Relationship with person with dementia - Spouse | 0.14 (0.45) | .06 | .752 | -0.42 (0.35) | -.23 | .231 |
| Relationship with person with dementia - Child | 0.10 (0.29) | .04 | .744 | -0.11 (0.23) | -.06 | .626 |
| Hours spent on care | -0.01 (0.01) | -.15 | .303 | 0.01 (0.01) | .11 | .435 |
| Time since dementia diagnosis care receiver | -0.01 (0.04) | -.02 | .817 | -0.04 (0.03) | -.13 | .189 |
| HADS - Anxiety | -0.07 (0.04) | -.22 | .080 | -0.04 (0.03) | -.17 | .193 |
| HADS - Depression | 0.09 (0.04) | .35 | .023* | 0.05 (0.03) | .23 | .141 |
| CRA | -0.01 (0.01) | -.01 | .928 | 0.01 (0.01) | .13 | .374 |
| RQI | -0.01 (0.01) | -.12 | .335 | -0.01 (0.02) | -.04 | .755 |
| ISR | 0.06 (0.02) | .34 | .002** | 0.01 (0.02) | -.03 | .815 |
| SSCQ | -0.01 (0.03) | -.04 | .764 | 0.03 (0.03) | .16 | .277 |
| <i>R</i> ² | | .172 | | | .151 | |
| Adjusted <i>R</i> ² | | .068 | | | .043 | |
| <i>F</i> | | 1.648 | | | 1.393 | |

Note. Z-scores were adjusted for age, educational level, and sex. For Category Fluency, the adjusted alpha level was calculated according to the Benjamini-Hochberg procedure,⁴⁷ leading to an alpha level of $(3/14 \times 0.05 =) .011$. For Letter Fluency, the adjusted alpha level was $(1/14 \times 0.05 =) .004$. CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; ISR, Inventory for Social Reliance; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

^aEducational level, according to Verhage,³⁹ recoded into low (1 - 4); medium (5); and high (6 - 7); medium was the reference category.

* $p < .05$, ** $p < .011$.

DISCUSSION

The primary aim of the current study was to examine if informal dementia caregivers performed similar to, worse than, or better on executive functioning and episodic memory tasks compared to non-caregivers. Which variables predicted the performance on these cognitive tasks was also examined.

The findings indicate that caregivers performed better on a test for immediate memory than non-caregivers despite their (slightly) higher levels of depression and anxiety. The caregivers performed similar to non-caregivers on tests for memory retention and executive functioning. These results are in line with recent, and relatively large, studies on this topic.^{21,22} A number of theories could explain these findings. Informal caregivers tend to experience more stress than non-caregivers,^{2,3,11} which can be associated with poorer cognitive functioning. However, the emerging view is that while extreme stress can lead to cognitive problems, mild stress levels are associated with enhanced cognitive functioning, especially immediate memory functioning, when the cognitive load is not excessive.⁴⁹ While we did not measure stress or cortisol levels directly, we hypothesize that the caregivers in our study experienced mild stress levels: while they had slightly higher HADS scores than non-caregivers, 80% still scored under the cut-off, indicating zero to mild symptoms of both depression and anxiety, whereas only one caregiver scored in the range of 'severe' symptoms. These mild symptoms could explain why the caregivers actually performed better or similar to non-caregivers on the cognitive tests. This is also in line with the study by Comijs et al.⁵⁰ who argued that mild chronic stressors are associated with better cognitive performance in older adults, whereas no stress or too much stress is associated with worse cognitive functioning. These notions are supported by the healthy caregiver hypothesis, which proposes that caregiving demands may serve to protect the caregivers' health and this could also include their cognitive proficiency.²³⁻²⁷ An important note however is that there are important individual differences in the cognitive impact of stress, with gender and age being associated factors,⁴⁹ so these results are not automatically generalizable to the individual caregiver. Another possible explanation for our finding lies in the fact that informal caregivers need to remember more than non-caregivers; they often think for two since they also need to remember things for the person with dementia. This could be seen as some sort of memory training, which is found to be beneficial in older adults due to plasticity of the brain.⁵¹ Finally, caregivers generally worry more about developing dementia themselves than non-caregivers, which is commonly called 'dementia anxiety'.^{52,53} Because of this fear, caregivers may be more driven or motivated to reduce their risk of dementia, by trying to live their lives in an enjoyable and meaningful way with positive attitudes, changing their negative lifestyle behaviors, and attempting to diminish passivity and negative attitudes. This may have in turn improved their cognitive functioning.⁵⁴ This hypothesis would however need to be comprehensively assessed in future studies.

Our results contradict our hypothesis and previous studies suggesting that the caregivers' cognition is worse than non-caregivers' cognitive performance.^{4-9,55} However, these studies were based on small samples (between 16 and 56), and not all controlled for age, sex, and educational level. In addition, while the caregivers in our sample had more anxiety and depression symptoms than non-caregivers, they still scored well below the cut-offs, while other studies typically find higher prevalence of depression and anxiety among caregivers.^{15,56,57} It is possible that caregivers involved in previous studies had more

depression, anxiety, and burden symptoms than the caregivers in the present study, which in turn may explain the differences in cognitive performance. The differences in depression, anxiety, and burden levels of the present study sample and other caregiver samples might be due to differences in recruitment strategies. The previous studies on caregiver cognition (except De Vugt et al.⁴) relied on convenience sampling using dementia service centers and support institutions. Caregivers recruited using these services are generally more burdened than caregivers recruited by other strategies, for example via (social) media, which were used in the present study.^{2,31} Our findings, combined with the findings of previous studies, may imply that caregiving does not necessarily lead to worse cognitive performance, but that differences exist between caregivers. We propose that the overburdened, depressed, and/or anxious caregiver subgroup may be at risk for worse cognitive performance, while the not-overburdened caregiver has intact (or even better) cognitive performance.

Regarding the prediction models, our findings are in contradiction with our hypotheses and previous research suggesting that more depression symptoms and more burden are associated with poorer cognitive functioning.^{5,8,9,13,14} A possible explanation for these differences is that, as outlined above, the caregivers did not have high levels of depression and burden. It is possible that only high levels of depression and burden are associated with worse cognition, which could not be examined due to the small range in scores: only one caregiver had a score indicating severe depression. After adjusting for multiple comparisons, we found that for each point increase on the ISR questionnaire for social reliance (range = 11 - 44), the score on the Category Fluency increased by 0.73 points and male caregivers score 0.06 higher than female caregivers on the Category Fluency task. While this was statistically significant, the effects were rather small and may not be clinically important. In addition, these factors only predicted Category Fluency scores; not the scores on the other cognitive tests, and were as such not 'systematic' predictors for cognitive functioning.

Several limitations should be noted. Only three neuropsychological tests were included, and it is unsure whether the same results would be obtained using other tests for the same cognitive functions. In addition, no conclusions can be drawn regarding other cognitive functions. However, performance on the fluency tasks has been successfully used as an index of executive functioning, as confirmed by neuropsychological and neuroimaging studies,^{58,59} and the logical memory test (remembering a story) is very comparable to everyday tasks. This enhances the translation of the results to daily life. The test-administrator was not blinded due to practical reasons: the semi-structured interview enclosed additional questions for the caregivers about caregiving-related topics; and the questionnaire booklet, about which the participants could ask questions, entailed specific questionnaires for the caregivers. Depression, anxiety, burden, and the other psychological characteristics, were measured using questionnaires which may be sensitive to social desirability. One should be hesitant in drawing conclusions about the psychological problems the caregivers actually experience.

Another limitation is that the study used data from one measurement point only, making it impossible to relate the findings to specific dementia stages or talk about cause-effect relationships. In addition, the results may look different longitudinally. It is possible that an extended caregiving period may result in more stress, which may lead to greater decrements in cognitive functioning compared to their non-caregiving counterparts. Various recruitment strategies were used, leading to a more heterogeneous caregiver sample, more generalizable to the overall caregiver population. However, the caregivers were recruited for an intervention study, which may have led to the inclusion of the more active caregiver with lower levels of stress and burden, excluding the overburdened caregivers. This might be reflected by the low average levels, and small range, of depression, anxiety, and burden. Since convenience sampling was used, where caregivers could contact the researchers and not vice versa, the response rate could not be calculated and there is no information regarding reasons for non-participation. The strengths of the study included the relatively large sample size, the inclusion of all informal caregivers irrespective of certain characteristics (e.g. only spouses), and the use of multiple recruitment strategies.

The findings have important implications for both clinical practice and scientific research. Caregiving can be very stressful for some caregivers, and can lead to problems with cognitive health, and those caregivers should receive support such as respite care and other interventions. However, the present study, among all caregiver types, showed that caregivers can also have better cognitive performance than non-caregivers. We did not find systematic predictors for cognitive functioning: the caregivers' performance was independent of sociodemographic and psychosocial characteristics, and psychological symptoms.

We argue that studies should be careful with generalizing their findings to the whole caregiver population given the heterogeneity in psychosocial characteristics, psychological symptoms, and other characteristics. In addition, we deem it important to research (and report) both the negative and positive effects caregiving can have on caregivers. Policy reports should also present a more balanced and comprehensive view of the current state of caregiving research, instead of focusing only on the negative consequences such as burden.

In clinical (dementia) practice, we encourage the clinician to pay attention to the caregiver in a more personal way, because some caregivers should receive help, while others may not need interventions. We argue that it is important that the clinicians are aware that cognitive performance is likely to vary within individual caregivers; caregivers can have worse, but also better cognitive functioning than non-caregivers.

In conclusion, we found no evidence that informal dementia caregivers have poorer memory and executive functioning. Future, longitudinal, research is needed to study how their cognition develops over time, as the care receiver's dementia progresses.

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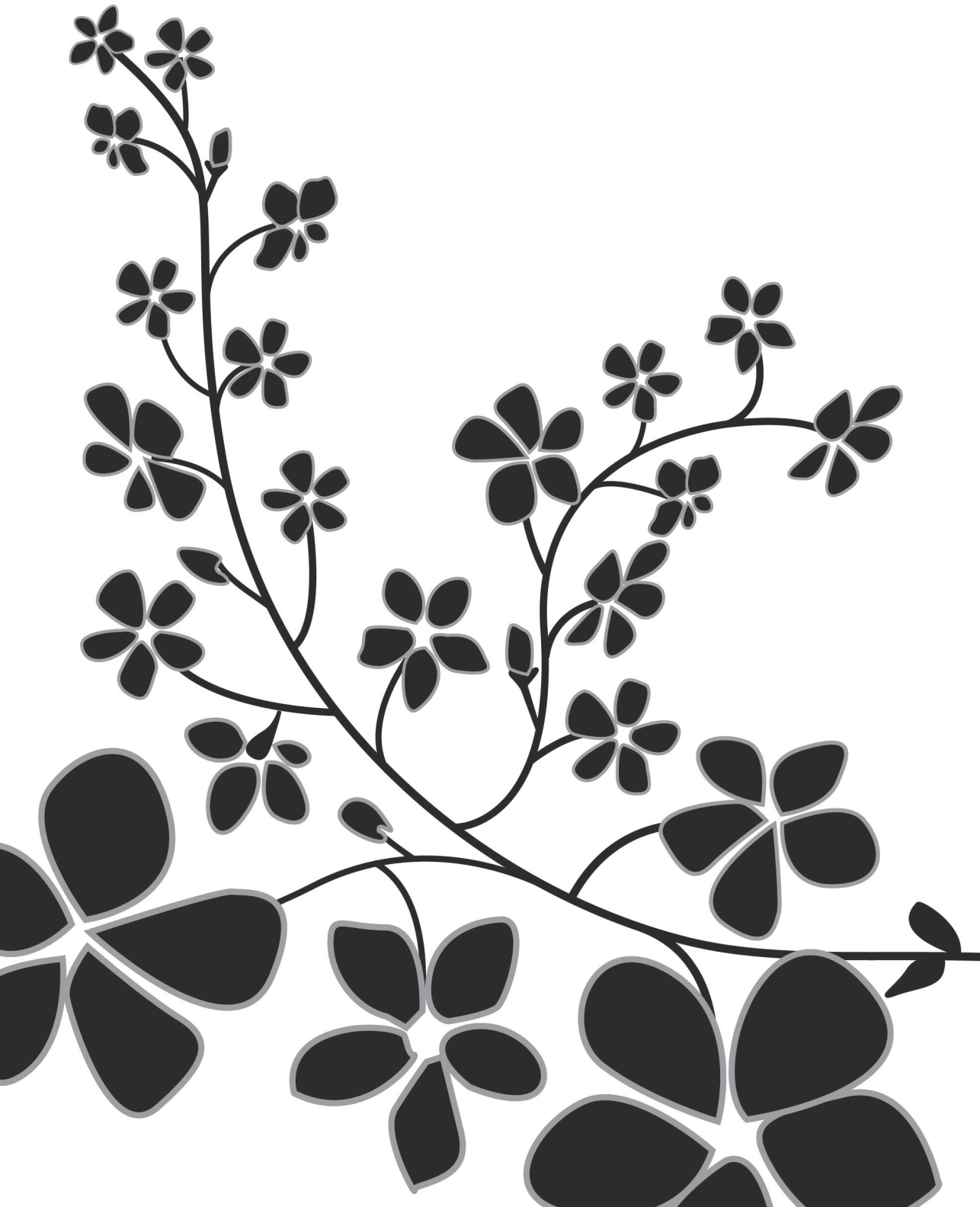
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Supplementary Table S1 Multivariable regression analyses for the cognition scores of the control group, with age, education, and sex; and the resulting normative formulae for the z-scores

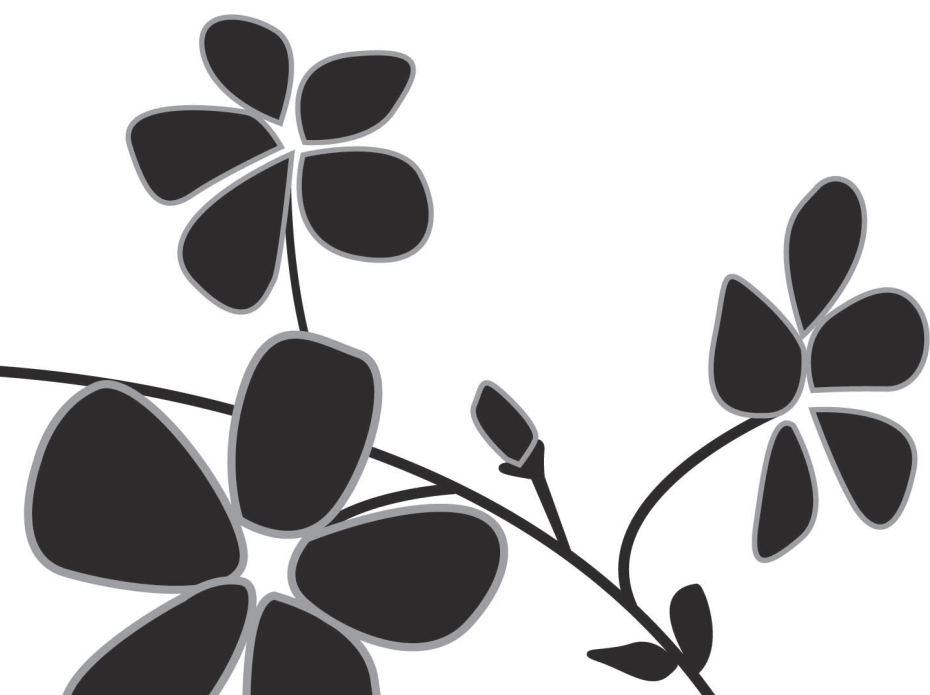
| Cognitive test | Predictor | <i>B</i> | <i>SE B</i> | <i>p</i> -value | <i>F</i> | <i>R</i> ² |
|--|----------------|----------|-------------|-----------------|----------|-----------------------|
| Letter Fluency | Intercept | 48.889 | 4.371 | <.001 | 10.188 | .183 |
| | Age | -0.218 | .071 | .002 | | |
| | Education Low | -5.205 | 2.774 | .062 | | |
| | Education High | 5.563 | 2.011 | .006 | | |
| | Sex | -3.298 | 2.002 | .101 | | |
| Formula: z-score = 48.89 + (-0.218*age) + (-5.205*education - low) + (5.563*education - high) + (-3.298*sex) | | | | | | |
| Category Fluency | Intercept | 53.475 | 3.265 | <.001 | 15.693 | .259 |
| | Age | -0.233 | 0.053 | <.001 | | |
| | Education Low | -4.928 | 2.068 | .018 | | |
| | Education High | 4.551 | 1.513 | .003 | | |
| | Sex | -1.467 | 1.507 | .332 | | |
| Formula: z-score = 53.475 + (-0.233*age) + (-4.928*education - low) + (4.551*education - high) + (-1.467*sex) | | | | | | |
| Logical Memory - Immediate Recall | Intercept | 29.696 | 2.316 | <.001 | 10.817 | .192 |
| | Age | -0.135 | 0.038 | <.001 | | |
| | Education Low | -2.238 | 1.470 | .130 | | |
| | Education High | 3.029 | 1.065 | .005 | | |
| | Sex | -0.376 | 1.061 | .724 | | |
| Formula: z-score = 29.696 + (-0.135*age) + (-2.238*education - low) + (3.029*education - high) + (-0.376*sex) | | | | | | |
| Logical Memory - Retention | Intercept | 112.836 | 9.040 | <.001 | 4.241 | .085 |
| | Age | -0.447 | 0.147 | .003 | | |
| | Education Low | -6.010 | 5.738 | .296 | | |
| | Education High | 2.380 | 4.158 | .568 | | |
| | Sex | -0.703 | 4.141 | .865 | | |
| Formula: z-score = 112.836 + (-0.447*age) + (-6.010*education - low) + (2.380*education - high) + (-0.703*sex) | | | | | | |

Note. Higher scores on the test indicate better performance. Age was measured in years. Sex was coded as male = 0, female = 1; education - low was coded as low = 1, high = 0; education - high was coded as high = 1, low = 0.



PART II

EXPLORING OPPORTUNITIES TO IMPROVE THE CAREGIVERS' LIVES



CHAPTER 4

EMPATHY IN INFORMAL DEMENTIA CAREGIVERS AND ITS
RELATIONSHIP WITH DEPRESSION, ANXIETY, AND BURDEN

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R.E. Mark
M.M. Sitskoorn

ABSTRACT

Background/Objective: Recent interventions aim to heighten informal caregivers' empathy levels assuming that this will lead to better well-being. However, previous studies have explored linear associations between empathy and aspects of well-being and yielded mixed results. We hypothesized that quadratic models may be more fitting to describe these relationships.

Method: A cross-sectional study, with two groups (201 informal caregivers and 187 non-caregivers) was conducted. Participants completed questionnaires on cognitive and affective empathy, and depression, anxiety, and caregiver burden. AN(C)OVA's and multivariable hierarchical regression analyses including linear and quadratic terms were used to analyze the data.

Results: For caregivers, there was a negative quadratic relationship between depression and cognitive empathy, and a positive linear relationship between anxiety and affective empathy, irrespective of sociodemographic characteristics. For non-caregivers, there were positive quadratic relationships between depression and cognitive and affective empathy, and between anxiety and affective empathy. The empathy levels did not differ between the groups.

Conclusions: While caregivers and non-caregivers had the same amount of empathy, the relationships between empathy, and depression and anxiety differed between the groups. Interventions for informal caregivers could aim to heighten cognitive empathy and to lower affective empathy to diminish depression and anxiety symptoms.

BACKGROUND

The prevalence of dementia is rising, with an estimated number of 131.5 million people living with dementia in 2050 worldwide.¹ Most people with dementia live at home where they are dependent on informal, or family, caregivers for their daily care. Informal caregivers are mostly spouses or children of the person with dementia, who do not get paid for caregiving. Informal caregivers can experience negative consequences of caregiving, with depression, anxiety, and caregiver burden as the most prevalent problems.²⁻⁵ Especially female,^{2,5} spousal caregivers,^{2,3,6} who have a low level of education⁷ appear to be at risk for these negative consequences. Many interventions for informal caregivers have been developed in order to diminish these negative consequences, most of which are moderately effective.⁸ Recent research is beginning to focus on heightening informal caregivers' empathy in an attempt to diminish caregiver depression, anxiety, and burden, and thereby enhance the lives of both the caregivers and the care receivers.⁹⁻¹²

Empathy is currently defined as a complex bio-psycho-social concept made up of at least two components.^{13,14} These include a cognitive component: knowing or understanding what another person is feeling, or the ability to understand another person's perspective, sometimes referred to as Theory of Mind; and an affective or emotional component: feeling what another person feels, sometimes referred to as sympathy; sharing or feeling another person's emotional state. These two constructs are associated with largely separate neural systems. Cognitive empathy has been associated with higher order functioning attributed to the medial and dorsolateral regions of the prefrontal cortex,¹⁵ whereas affective empathy has been linked to activation of both subcortical (e.g. amygdala, hypothalamus, and hippocampus) and cortical (e.g. anterior insula) structures.¹⁶ These conceptual and neurobiological distinctions highlight the importance of investigating the effects of affective and cognitive empathy separately, which is not always done by previous research.

Empathy is often regarded as an important quality 'good' doctors have and fundamental to good patient-clinician relationships. A review¹⁷ found that patients of empathic physicians had better health outcomes, lower levels of anxiety, and were more satisfied with the care they received. In addition, more empathy of informal caregivers was related to higher quality of care for the person with dementia.¹⁸ Because of these positive outcomes for patients, interventions aimed at professionals teaching them how to be empathic have been designed.¹⁹ Following these developments, interventions for informal caregivers are beginning to focus on heightening caregiver empathy, because it is believed that this could result in better well-being for the caregiver and subsequently better care for the person with dementia.^{11,12} However, the influence of empathy on the empathizer's lives, especially for informal caregivers, is yet unclear and has only been examined in a few studies. More studies in this field have focused on the link between empathy and aspects of well-being

(mostly anxiety) in the general population, while others have examined the link between empathy and burnout in healthcare professionals. Burnout encompasses symptoms caused by (work-related) stress, such as exhaustion, depersonalization, and reduced personal accomplishment,²⁰ and has been related to aspects of caregiver burden. The effects of empathy on these outcomes are not always positive for the empathizer.

In the general population, a cross-sectional study with parent-adolescent dyads found that parental empathy was associated with greater parental self-esteem, and purpose in life, but also with higher systematic inflammation.²¹ In addition, an experimental study found that participants with high trait empathy who had been instructed to actively appraise the thoughts and feelings of another distressed individual, more effectively learned to fear a neutral stimulus, than those who had not been instructed to do so.²² Shu et al.²³ found a causal role for state empathy in the experience of vicarious anxiety: taking an empathic perspective increased the perception of vicarious anxiety and sustained effects of anxiety such as risk aversion and sleep disruption. For healthcare professionals, a recent review²⁴ found evidence for both positive (more empathy - more burnout symptoms), and negative relationships (more empathy - fewer burnout symptoms). Lamothe et al.²⁵ found, in a cross-sectional survey-study among 296 general practitioners, that the combination of higher affective empathy and higher cognitive empathy predicted a lower proportion of burnout. On the other hand, they also found that general practitioners who had high levels of affective empathy, in combination with low levels of cognitive empathy, were at greater risk of burnout. A cross-sectional study among >1000 medical students,²⁶ found aspects of burnout to be inversely correlated with both cognitive and affective empathy. They also found that a higher quality of life and fewer depression symptoms were associated with more affective empathy.

For informal dementia caregivers, only three studies have examined the association between empathy and aspects of well-being.²⁷⁻²⁹ Shim et al.²⁸ conducted a qualitative study, among 57 spousal dementia caregivers. They found that caregivers with higher empathy levels were more positive, more acceptant of their loved one's changes, had a better relationship with the care receiver, and described caregiving as something satisfactory and meaningful to them; while those with lower empathy levels took a more negative stance to caregiving. Sutter et al.²⁹ found, in a cross-sectional study among 90 informal dementia caregivers, that more empathy was significantly correlated with less depression, burden, and stress. However, in regression analyses, only stress was significantly predicted by empathy after controlling for sociodemographic variables. Lee et al.²⁷ conducted a cross-sectional study among 140 informal dementia caregivers. In univariate analyses, they found that more cognitive empathy was significantly correlated with lower stress appraisal, lower threat appraisal, fewer depression symptoms, and more life satisfaction. On the other hand, affective empathy was found to be significantly correlated with higher stress appraisal. In multivariable linear regression analyses, they found that only life satisfaction was significantly predicted by less

affective empathy after controlling for caregiver age, sex, and spousal status. They found no predictive ability for neither affective nor cognitive empathy for depression.

Overall, it is not yet clear how empathy is related to aspects of well-being. All of the above-described studies have examined linear relationships between empathy and the empathizers' well-being, meaning that the authors assumed that more (or less) empathy was systematically related to more (or less) anxiety/depression. However, since there is evidence for both a positive and a negative relationship, we hypothesized that quadratic models may be more appropriate to explain the relationships. We hypothesized that there exist quadratic, u-shape, relationships between empathy, and depression, anxiety, and burden. More specifically, that there exist 'optimal' levels of empathy, whereas too little or too much empathy may be detrimental. The theory behind this is that too much empathy, and taking on another person's feelings (affective empathy), and mentally replace oneself into the another person's shoes (cognitive empathy), can hypothetically cause people to take on another person's burden, and cause them to lose the ability to know or prioritize what they want or need themselves. Too little empathy, on the other hand, may be associated with a poorer understanding of the person with dementia. This may cause failure to recognize dementia symptoms as part of dementia instead of intentional acts of the person with dementia. We hypothesized that this may cause more arguments between caregiver and care receiver, and in turn more depression symptoms. If it is known how empathy relates to depression, anxiety, and burden in informal caregivers, it could be determined if interventions should focus on heightening or reducing (cognitive and/or affective) empathy to ultimately enhance the lives of both caregivers and the people with dementia. The primary aim of this study was to examine how empathy, depression, anxiety, and burden related to each other in informal caregivers. To be able to compare our findings to the general population, we also examined these relationships for non-caregivers. In addition, we examined if empathy levels (both affective and cognitive) differed between informal dementia caregivers and non-caregivers.

METHODS

Participants

There were two groups: (1) 201 adult (18+) informal caregivers who spent at least eight hours per week on care for a relative, spouse, or friend with dementia who lived at home (not institutionalized and not prohibited from 'normal' care). This group was recruited for the longitudinal Into D'mentia study, of which the protocol¹⁰ describes the methods and procedure in greater detail. The second group consisted of 187 control group participants, comprising adults (18+) who did not provide care for a loved one with an illness. This group was recruited via the same institutions as the informal caregivers, and via (social) media, and both private and professional networks of the authors.

Procedure

All participants completed a semi-structured interview (containing questions about sociodemographic variables, and dementia-related variables for the caregivers) and a questionnaire booklet. The interviews took place either at Tilburg University or at the participants, home; depending on their preference. Written informed consent was obtained and the study protocol has been approved by the local ethics committees.

Measures

Two subscales from the Interpersonal Reactivity Index (IRI)³⁰ were used to measure empathy; Perspective Taking (PT) and Empathic Concern (EC). PT measures cognitive empathy, the tendency to take the psychological point of view of others (Cronbach's $\alpha = .67$, $\lambda-2 = .68$). EC measures affective empathy, the ability to feel for others (Cronbach's $\alpha = .57$, $\lambda-2 = .58$). Both subscales consist of seven items, each rated on a 5-point Likert scale (0 - 4), with a maximum score of 28 per subscale.³⁰

Depression and anxiety were measured using the Hospital Anxiety and Depression Scale (HADS).³¹ The HADS is a self-report questionnaire consisting of 14 items; seven for both Depression (Cronbach's $\alpha = .78$, $\lambda-2 = .79$) and Anxiety (Cronbach's $\alpha = .81$, $\lambda-2 = .82$). The responses are based on the relative frequency of symptoms over the past week, using a 4-point Likert scale ranging from 0 (not at all) to 3 (very often). The maximum score for both scales is 21; higher scores indicate more depression/anxiety symptoms.

Caregiver burden was assessed using the Caregiver Reaction Assessment-Dutch (CRA-D),³² a self-report measure which includes the aspects Self-esteem, Financial problems, Impact of caregiving on disrupted schedule, Family support, and Health problems. The participant reports to what extent they agree with the statements on a 5-point scale (1 - 5). The scores were summed to one total score, with higher scores indicating more burden (maximum total score = 120, Cronbach's $\alpha = .87$, $\lambda-2 = .89$). This questionnaire was completed by the informal caregiver group only because the questions are not applicable to non-caregivers.

The sociodemographic, control, variables were age (in years), sex (male/female), and level of education according to Verhage (recoded into low, medium, and high).³³ For the caregivers, the type of relationship with the person with dementia (spouse/child/other), the time since diagnosis of the care receiver (in years), and the time providing care a week (in hours) were also examined.

Statistical analysis

Statistical analyses were performed using SPSS Statistics version 22.³⁴ Independent samples *t*-tests and chi-square tests were used to compare the groups on the sociodemographic variables age, sex, and educational level. To test if there were linear or quadratic relationships between empathy (PT and EC separately) and depression/anxiety/burden for the informal caregivers, six multivariable hierarchical regression analyses were executed, each consisting of three blocks. Block 1 consisted of the (control) sociodemographic variables, Block 2 consisted of one empathy measure (PT or EC), and Block 3 consisted of the accompanying squared empathy measure.³⁵ The continuous predictors (PT and EC) were group-centered. Within the blocks, the forced entry method was used to reduce the influence of random variation in the data and increase the replicability of the results.³⁶ For the non-caregivers, these analyses were repeated for the dependent variables depression and anxiety. The comparative analyses between the groups on the dependent variables PT, EC, depression, and anxiety were conducted using AN(C)OVA's. Because females generally score higher on empathy questionnaires,³⁷ sex was added as a covariate in the ANCOVA's on PT and EC. A *p*-value of < .05 was considered statistically significant.

RESULTS

The caregiver group ($n = 201$) had a mean age of 60.8 ($SD = 12.03$), and the control group ($n = 187$) had a mean age of 58.6 ($SD = 13.4$). Most participants were female (79% of the caregivers, and 71% of the non-caregivers), and most attained a high level of education (49% of the caregivers and 50% of the non-caregivers). Most caregivers cared for their spouse (41%) or their parent (45%), and 39% lived with the person with dementia. As shown in Table 1, the groups were matched on age, the proportion male/female participants, and the level of education.

Table 1 Sociodemographic characteristics of the groups

| | Informal caregivers (<i>n</i> = 201) | Non-caregivers (<i>n</i> = 187) | Test- value ^a | <i>p</i> -value |
|--|--|-------------------------------------|-----------------------------|-----------------|
| Age | 60.8 ± 12.03 | 58.6 ± 13.4 | 1.67 | .095 |
| Male sex | 43, 21% | 55, 29% | 3.30 | .069 |
| Level of education ^b | Low | 30, 15% | 0.29 | .860 |
| | Middle | 72, 36% | | |
| | High | 99, 49% | | |
| Relationship with care receiver | Spouse | 82, 41% | | |
| | Child | 90, 45% | | |
| | Other | 28, 14% | | |
| Cohabiting with care receiver, %yes | 78, 39% | | | |
| Hours spent on care a week | 56.0 ± 63.1 | | | |
| Years since dementia diagnosis person with dementia | 3.1 ± 2.5 | | | |

Note. Values presented as *M* ± *SD* or *n*, %.

^atest value: for continuous variables, *t*-values, for categorical variables χ^2 values; ^blevel of education according to Verhage (recoded into low, medium, and high).³³

Table 2 shows the relationships between PT, EC, and depression, anxiety, and burden in informal caregivers. Depression was found to have a significant (negative) quadratic relationship with PT ($\beta = -.14, p = .042$). Anxiety was found to have a significant linear positive relationship with EC ($\beta = .30, p < .001$): higher levels of EC were related to more anxiety symptoms, see Figure 1. Neither PT nor EC significantly predicted caregiver burden.

Table 2 Relationship between depression, anxiety, burden and empathy in informal caregivers

| | Depression | | Anxiety | | Burden | |
|------------------------------------|--------------|---------|--------------|---------|--------------|---------|
| | ΔR^2 | β | ΔR^2 | β | ΔR^2 | β |
| Model 1. Perspective Taking | | | | | | |
| Block 1. Control variables | .169** | - | .098* | - | .198** | - |
| Block 2. PT | .001 | -.03 | .001 | .04 | .000 | .02 |
| Block 3. PT ² | .021* | -.14 | .007 | -.08 | .000 | .01 |
| Total <i>R</i> ² | .191** | | .106* | | .199** | |
| Model 2. Empathic Concern | | | | | | |
| Block 1. Control variables | .161** | - | .100* | - | .192** | - |
| Block 2. EC | .017 | .13 | .087** | .30 | .005 | .07 |
| Block 3. EC ² | .004 | -.06 | .002 | -.04 | .009 | -.09 |
| Total <i>R</i> ² | .183** | | .189** | | .206** | |

Note. Control variables included age, sex, level of education (low, high), type of relationship with care receiver (spouse, child), hours spent on care a week, and time since dementia diagnosis of the person with dementia.

EC, Empathic Concern; PT, Perspective Taking.

p* < .05, *p* < .001.

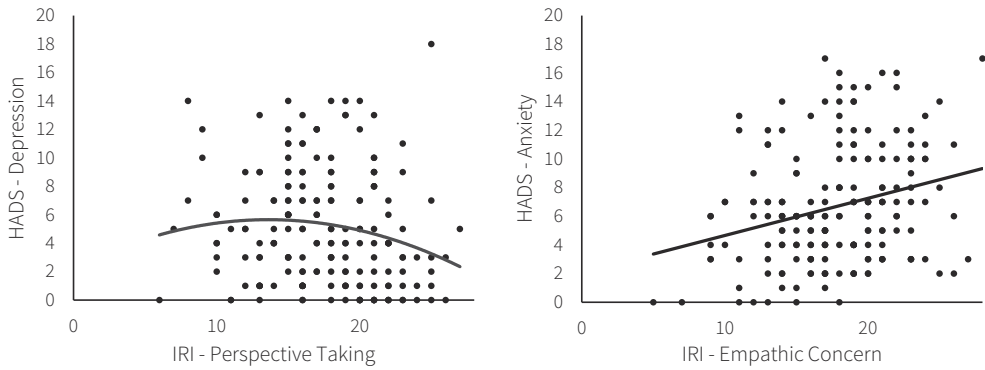


Figure 1 The relationship between depression and PT, and anxiety and EC, in informal caregivers
Note. HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Scale.

Table 3 and Figure 2 show the relationship between empathy and anxiety and depression for non-caregivers. There were significant positive quadratic relationships between depression and PT ($\beta = .19, p = .010$), depression and EC ($\beta = .19, p = .009$), and anxiety and EC ($\beta = .04, p = .048$). A positive quadrature relationship indicates that too much or too little empathy is associated with more depression or anxiety, whereas a ‘moderate’ level of empathy is associated with the least depression or anxiety symptoms.

Table 3 Relationship between depression, anxiety, and empathy in non-caregivers

| | Depression | | Anxiety | |
|------------------------------------|--------------|---------|--------------|---------|
| | ΔR^2 | β | ΔR^2 | β |
| Model 1. Perspective Taking | | | | |
| Block 1. Control variables | .040 | - | .057* | - |
| Block 2. PT | .004 | -.06 | .001 | .03 |
| Block 3. PT ² | .036** | .19* | .013 | -.11 |
| Total R ² | .080* | | .071* | |
| Model 2. Empathic Concern | | | | |
| Block 1. Control variables | .047 | - | .053 | - |
| Block 2. EC | .013 | .12 | .071* | .28** |
| Block 3. EC ² | .037* | .19* | .020* | .04* |
| Total R ² | .098* | | .143* | |

Note. Control variables included age, sex, and level of education (low, high).

EC, Empathic Concern; PT, Perspective Taking.

* $p < .05$, ** $p < .001$.

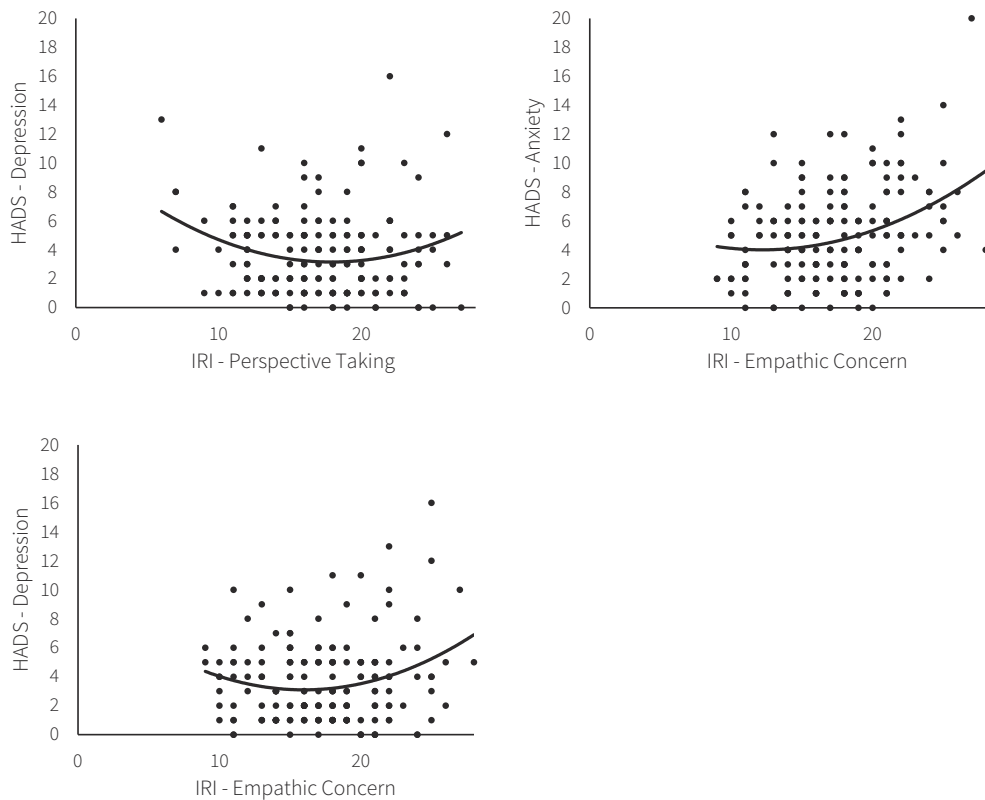


Figure 2 The relationship between depression and PT and EC, and anxiety and EC, in non-caregivers

Note. HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Scale.

Table 4 shows the comparative analyses between the groups. The groups did not differ significantly on PT or EC. The informal caregivers experienced significantly more depression symptoms ($M = 5.04, SD = 4.0$ versus $M = 3.6, SD = 2.8, F = 16.38, p < .001$) and more anxiety symptoms ($M = 6.6, SD = 4.0$ versus $M = 5.0, SD = 3.3, F = 18.60, p < .001$) than non-caregivers.

Table 4 Empathy, depression, anxiety, and burden scores of the groups

| | Informal caregivers (<i>n</i> = 201) | Non-caregivers (<i>n</i> = 187) | <i>F</i> -value | <i>p</i> -value | Partial η^2 |
|--------------------------|--|-------------------------------------|-----------------|-----------------|------------------|
| IRI - Perspective Taking | 17.6 ± 4.1 | 17.0 ± 4.3 | 0.98 | .323 | .003 |
| IRI - Empathic Concern | 17.8 ± 4.2 | 17.4 ± 4.1 | 2.66 | .104 | .007 |
| HADS - Depression | 5.0 ± 4.0 | 3.6 ± 2.8 | 16.38 | <.001** | .042 |
| HADS - Anxiety | 6.6 ± 4.0 | 5.0 ± 3.3 | 18.60 | <.001** | .047 |
| CRA | 60.0 ± 12.3 | | | | |

Note. Value presented as *M* ± *SD* or *n*, %. The CRA was filled out by the caregivers only. For Perspective Taking and Empathic Concern, sex was added as a covariate in the analyses.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Scale.

p* < .05, *p* < .001.

DISCUSSION

Interventions for informal caregivers are beginning to focus on heightening the empathy informal caregivers have for the persons with dementia they care for. The idea is that this should subsequently enhance the well-being of both the caregivers and the people with dementia. Yet, previous research on the impact of heightened empathy on the empathizer's well-being yielded contradictory results. However, these studies all investigated linear relationships between empathy and (aspects of) well-being. Since there is evidence for both positive and negative relationships, we hypothesized that quadratic models may be more appropriate to explain the relationships.

For informal dementia caregivers, we found a negative quadratic relationship between cognitive empathy and depression, and a positive linear relationship between affective empathy and anxiety. For non-caregivers, we found positive quadratic relationships between both cognitive and affective empathy and depression, and affective empathy and anxiety. The levels of neither cognitive nor affective empathy differed between the groups. To our knowledge, only two studies quantitatively examined the association between empathy and aspects of well-being in informal caregivers.^{27,29} Lee et al.²⁷ found, using univariate analyses, that more cognitive empathy was correlated with less stress, less depression, less threat appraisal, and higher life satisfaction. Sutter et al.²⁹ also found, in univariate analyses, that more empathy was correlated with less depression, burden, and stress. However, in the study by Lee et al.²⁷, neither affective nor cognitive empathy predicted depression in a multivariable linear regression analysis when controlling for activities of daily living of the care receiver, caregiver age, sex, and spousal status. When Sutter et al.²⁹ employed multivariable regression analyses, empathy predicted less stress only. This finding is comparable to our results: we also did not find a linear relationship between depression and cognitive empathy. Instead, we tested a quadratic model, which provided a better fit: an average amount of empathy was

associated with the most depression symptoms, whereas the highest amount of empathy was associated with the least depression symptoms. A systematic review,²⁴ focusing on the relationship between empathy and burnout in health professionals, found evidence for both a negative relationship and a positive relationship between the two. However, they found more evidence for a negative association (more empathy - less burnout), especially for cognitive empathy. This is largely in line with our findings for informal caregivers since higher levels of cognitive empathy corresponded to lower levels of depression.

However, in contradiction with the review by Wilkinson et al.²⁴ and the study with informal caregivers by Sutter et al.²⁹, we found no (significant) relationship between empathy and caregiver burden, a concept related to burnout. A possible explanation for this difference in results lies in the questionnaires used. We measured caregiver burden using the total score of the CRA-D, which consists of the subscales Self-esteem, Financial problems, Impact of caregiving on disrupted schedule, Family support, and Health problems. These subscales are different from the subscales of the Maslach Burnout Inventory (MBI)³⁸ which was used by the studies in the review by Wilkinson et al.²⁴; and the Zarit Burden Inventory (ZBI) used by Sutter et al.²⁹. The burnout questionnaire MBI includes the subscales Emotional exhaustion, Depersonalization, and Personal accomplishment. The ZBI is a unidimensional scale, but includes questions about exhaustion, personal strain, role strain, and guilt or self-criticism³⁹ and may be more similar to questionnaires for burnout such as the MBI. These differences in operationalizations can explain the differences in results. Future research about burden and empathy could include another questionnaire for burden, like the ZBI and examine if similar results are obtained.

Lee et al.²⁷ found affective empathy to negatively predict life satisfaction, but they did not assess caregiver anxiety. In fact, the link between affective empathy and anxiety has not been researched before in informal caregivers. We found that more anxiety symptoms were predicted by more affective empathy. This result is in line with research in the general population: Olsson et al.²² found that greater empathy levels relate to more vicarious fear, and Shu et al.²³ even argued for a causal pathway between empathy and anxiety, where more affective empathy leads to more anxiety. In addition, our results can be explained by the findings of the review by Wilkinson et al.²⁴. They found studies supporting the theory of 'compassion fatigue', whereby clinicians who demonstrate high levels of affective empathy suffered from compassion fatigue, which then leads to burnout. Our finding, that too much affective empathy, or 'feeling what another person feels' is associated with more anxiety, can be explained by the same theory. For informal caregivers, this might especially be the case since the other person has dementia and informal caregivers are generally more anxious to get dementia themselves.⁴⁰ However, this review by Wilkinson et al.²⁴ focused on health professionals, and not informal caregivers. Although they both 'care for' someone with dementia, the relationship between the caregiver and care receiver is intrinsically different

for informal and professional caregivers. Informal caregivers are more personally involved, which should be taken into account when comparing these populations.

In fact, we found that while the levels of empathy did not differ between informal caregivers and non-caregivers, the relationships between (affective and cognitive) empathy and depression and anxiety, were different for caregivers and non-caregivers. For non-caregivers, as hypothesized, we found that too much, and too little, cognitive empathy predicted more depression symptoms. In addition, we found that too much, and too little affective empathy predicted both more anxiety and depression symptoms. These findings, compared with our findings for caregivers, might indicate that empathy has different effects on the empathizer when one cares for a person with dementia compared to when one does not. A possible explanation for these different relationships is that caregivers interpret the empathy questionnaire with their care receiver in mind, whereas non-caregivers think of more general scenarios without thinking of specific persons or situations. The Perspective Taking subscale of the IRI encompasses statements like “When I’m upset at someone, I usually try to “put myself in his shoes” for a while”. When caregivers positively reflect to these statements with the care receiver in mind, this might mean that they have fewer arguments with the care receiver, and a better relationship with each other, which in turn might lead to fewer depression symptoms. On the other hand, from the point of view of the non-caregivers, always trying to see things from another’s perspective might be fatiguing. We think that, when one always (in any situation) acts according to this principle, this could cause them to lose the ability to prioritize what they want or need themselves. Then, too much cognitive empathy could in turn lead to more depression symptoms. We therefore think that one should be hesitant to compare the relationship between empathy, and anxiety or depression, in different populations.

Some limitations should be addressed. To measure empathy, we used the IRI, arguably the most-used measure to assess empathy, especially in the general (not professional/medical) population. However, some of our participants found the questions difficult to answer, even after giving further clarification if they asked for this during the interviews. In addition, the reliability of the questionnaire was quite low, and since empathy questionnaires rely on self-report, one could argue that instead of measuring cognitive and affective empathy, only the appraisal of empathy is measured: the participants’ opinion about how they would feel or act in a certain situation, rather than the emotion or behavior itself. A means to overcome these questionnaire-related problems in future studies is to also include objective measures of empathy (behavioral tasks or empathy accuracy tasks accompanied by psychophysiological methods).^{41,42} Then, empathy itself could be related to aspects of well-being, instead of only the participants’ appraisal of their empathy. Last, the study was cross-sectional in design making it impossible to talk about cause-effect relationships. Strong points of this study are its large sample sizes, the unique examination of both linear and quadratic

relationships, and the inclusion of both informal caregivers and non-caregiver control participants enabling us to put the results of the informal caregivers into perspective.

Conclusions

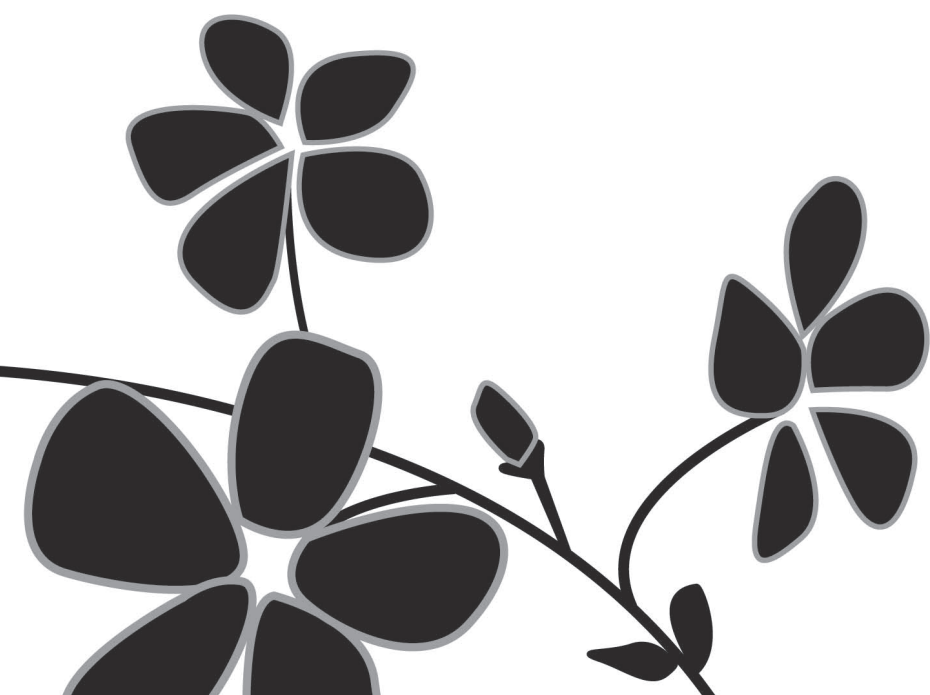
Our results have important implications for future research and clinical practice. We found that quadratic models examining the relationship between empathy and aspects of well-being may fit better than linear models. For non-caregivers, there seems to be an 'optimal' level of (cognitive and affective) empathy, whereas too much or too little empathy is associated with more depression/anxiety symptoms. Future research into empathy and its consequences should bear this in mind. In addition, we conclude that caregivers have a 'normal' amount of empathy, compared to non-caregivers. In caregivers, this normal level of cognitive empathy was associated with the most depression symptoms, which might be detrimental to their well-being. Higher levels of cognitive empathy might be ideal since this was associated with fewer depression symptoms. In addition, less affective empathy was associated with fewer anxiety symptoms. Interventions for informal caregivers could aim to heighten cognitive empathy to diminish depression symptoms and to lower affective empathy to diminish anxiety symptoms. Possible strategies could include psychoeducation, or role-play to increase perspective taking, and coping skill-training or counseling to diminish the tendency to share the emotions of the person with dementia.

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CHAPTER 5

TESTING THE EFFECTIVITY OF THE MIXED VIRTUAL REALITY
TRAINING INTO D'MENTIA FOR
INFORMAL CAREGIVERS OF PEOPLE WITH DEMENTIA:
PROTOCOL FOR A LONGITUDINAL, QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Introduction: Informal caregivers for people with dementia often feel (over)burdened by the care for a loved one with dementia, and this can have various deleterious effects on both caregivers and patients. Support for caregivers is urgently needed, and for this reason the dementia simulator Into D'mentia was developed in which caregivers experience what it is like to have dementia. The simulator attempts to heighten caregivers' empathy and understanding for the patient and, in turn, diminish their own caregiver burden. The current study evaluates whether the simulator is effective on a number of outcomes.

Methods and analysis: A longitudinal, quasi-experimental study is ongoing in the Netherlands. We aim to recruit 142 caregivers in total divided over two groups: 71 caregivers in the intervention group and 71 caregivers in the control group. All participants will complete interviews and questionnaires at four time points; at baseline, one week, 2.5 months, and 15 months after the training. The primary outcomes include: empathy, caregiver burden, caregiver's sense of competence, relationship quality with the person with dementia, anxiety, and depression.

Ethics and dissemination: This study is being carried out in agreement with the Declaration of Helsinki and the protocol has been approved by the local ethics committees.

Registration details: This study is registered with the Netherlands Trial Register (number = NTR5856).

BACKGROUND

The number of people living with dementia worldwide is estimated at 46.8 million.¹ This number will double by 2030 and more than triple by 2050.² In the Netherlands 260 000 people were diagnosed with dementia in 2014. Seventy percent of these people live at home and are dependent on informal caregivers (hereafter: caregivers) for their daily care.³ Caregivers are mostly unpaid spouses, sons, daughters, friends, or relatives.

Although caregiving is satisfying for some caregivers,⁴⁻⁶ it can also be very burdensome.^{7,8} Caregivers often experience higher rates of depression⁹, poorer physical and mental health,¹⁰⁻¹² a lower sense of well-being, more social isolation,¹³ and more financial burden¹⁴ than people who do not provide care. The likelihood of nursing home admission for the person with dementia rises when their caregiver becomes overburdened and can no longer cope.¹⁵ An intervention which supports caregivers in their caregiving role is therefore very desirable.

In the past 10 - 15 years, several interventions have been developed to support caregivers. These include training and education programs, support groups, counselling, web-based, and multi-component interventions. These have been found to be moderately effective in improving the quality of care and competence of caregivers,¹⁶⁻¹⁸ diminishing caregiver burden,^{18,19} health related problems,^{20,21} and stress,^{21,22} improving the quality of life of both caregivers and their patients,²³ and diminishing the dependency on professionals.^{18,21} However, most of these interventions lack practical tips and advice on how to apply the knowledge gained in daily life. We hypothesized that if caregivers could actually experience symptoms of dementia themselves they might better understand their patients and in turn have more empathy for them. With this hypothesis in mind the mixed virtual reality simulator 'Into D'mentia' was developed in 2010.²⁴ Education and support groups were added to this simulator training (taking place after the simulation), because these have been found to be beneficial in other interventions.^{25,26}

The simulator's goal is to increase caregivers' understanding and empathy for the person with dementia. It is hypothesized that this will lead to decreased stress levels, caregiver burden and health problems associated with caregiving in the caregivers themselves, and that this in turn will lead to the person with dementia living at home for longer before being institutionalized (see Figure 1). A better understanding of dementia has been found to promote the well-being of caregivers in a previous study.²⁷ In another study, when caregivers cared in a more empathetic way for the person with dementia, their own stress level was reduced.²⁸ Professionals who have more (versus those who have less) empathy have also been found to have fewer burnouts and are more satisfied with their work as a professional caregiver, while the people with dementia under their care adhere better to therapy and have better health related outcomes.^{28,29}

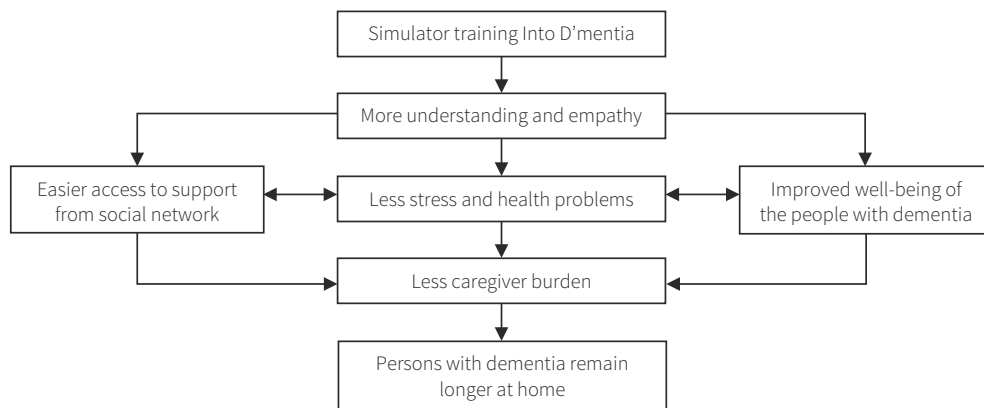


Figure 1 The simulator's goals

The aim of the current study is to assess the effectivity of the Into D'mentia simulator on a number of variables over time including: empathy, caregiver burden, feelings of competence of caregiving, depression, anxiety, the relationship between caregivers and their patients, and caregivers' health. This will be the first study that evaluates an intervention which attempts to simulate dementia for informal caregivers. Here we describe the design and protocol of this study.

METHODS AND ANALYSES

Design

A longitudinal, quasi-experimental study with two groups is ongoing. The study began in 2014, the final measurements will be made in 2018. Participants are evaluated four times: one week before the Into D'mentia training (T1), and one week, 2.5 months, and 15 months after the training (T2, T3, T4 respectively). The control group is tested at the same time intervals, starting at T1. Figure 2 shows a graph of the time schedule and important dates.

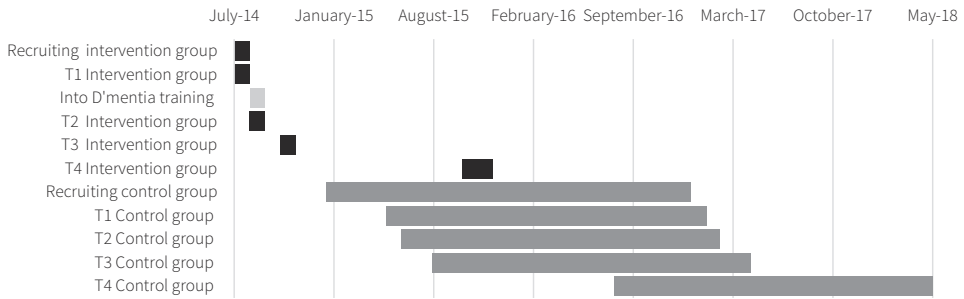


Figure 2 Time schedule of the study

Note. The participants were recruited consecutively. The intervention group has been recruited in one month (July 2014), whereafter the Into D'mentia intervention took place. The recruitment of the control group started in May 2015. Final measurements will be made in May 2018.

Study population

Two groups are created and consecutively recruited:

The intervention group. This group receives the Into D'mentia simulator training (and is not prohibited from usual care). The group consists of informal caregivers of a relative, friend, or spouse with dementia. The participants are recruited from de Wever in Tilburg, the Netherlands, an organization for eldercare; elderly federations; Alzheimer Nederland; case managers; centers for daytime activities for people with dementia; and via social media.

Inclusion criteria

- An informal caregiver for a spouse, family member, or friend with dementia; spending at least eight hours a week on caring for the patient who lives at home (not institutionalized).
- At least 18 years old (no upper age limit).

Exclusion criteria

- Physical disabilities which make entrance into the simulator impossible.
- Severe communication disabilities which make understanding of the simulator impossible (e.g. insufficient understanding of the Dutch language, blindness, or deafness).
- Self-reported severe psychological or medical disabilities which make the simulator too confusing (including self-reported dementia).

The control group. This group also consists of caregivers. The recruitment, inclusion and exclusion criteria are the same as for the intervention group. The only difference is that this group does not experience the intervention and as such is an attention-only group. This group is not prohibited from usual care. After completion of the study, a group meeting will be

organized as compensation for participating in the study. During this meeting, professionals will provide information about dementia and the participants will have the opportunity to ask questions.

Procedure

Eligible participants receive oral and written information about the study from case managers, nurses, and supervisors at day-time activity centers; or only written information on social media. Eligible participants are invited to contact the researchers (LJ) by phone or e-mail if they have questions and to receive more information about the study. If they are interested in participating, the appointment for the first interview is scheduled and the questionnaires are sent. For the intervention group, an appointment for the intervention training is made at the same time. Written consent is also obtained. For the follow-up assessments (T2 - T4), participants are informed by letter, telephone, or e-mail and invited to participate after which an appointment is scheduled.

For both the intervention and the control group, four measurements take place; for all four assessments a semi-structured interview is conducted and a questionnaire booklet is provided. The interviews are administered in a standardized way by trained neuropsychologists and take place either at the participant's home or at Tilburg University depending on their preference. The questionnaire booklet is sent to the participants before the appointment for the interview with the request that they complete it at home and bring it with them to the interview when they can receive help should problems arise. The questionnaires and interviews are identical for the two groups. The only exception being for the control group's interview, where questions about the simulator training are not relevant and therefore omitted.

Intervention

The intervention is a mixed-reality dementia simulator training. The training consists of three parts: the simulation, an individual conversation with the trainer immediately after the simulation, and a group meeting with the other participants one to two weeks later. In the simulator, the participants experience what it is like to have dementia. The training was developed based on literature reviews and on talks with caregivers, professionals, and a number of people with dementia.²⁴ The caregivers, professionals, and people with dementia were also involved in the process of developing, altering, and improving the intervention. They all approved of the final simulator, which we are currently using in this study. The simulator training takes place in a portable unit in which a little front yard, a bathroom, and a kitchen are built. After a short individual introduction, the participant enters the simulator unit. The participant wears a speaker vest, with microphones from which their inner voice

tells the story. This inner voice gives them specific instructions, for example to turn on the radio which then appears to not work properly. The participant's 'daughter' is projected on a screen using a beamer and she behaves like many caregivers do, for example talking about the patient while the patient is in the room or getting frustrated. Several audio-visual elements make the simulator interactive, allowing the participant to make choices and thereby influence the storyline.

Empathic reactions of negative situations (like caring for a relative with pain, or in this case, dementia), can lead to stress, or negative changes in neural networks.³⁰ To ensure the safety and well-being of the participants, immediately after the training an individual conversation with the trainer is organized. During this conversation, the participants discuss their experiences in the simulator and the trainer comforts the participants if needed. If the participants are heavily distressed, they can also telephone the research team (all trained psychologists) for help. The participants are encouraged to discuss their experiences in the simulator with family members or friends regardless of immediate stress reactions. The participants can call the research team if they experience any negative reactions which cannot wait until the group meeting. A group meeting with 8 - 12 other participants is organized one to two weeks after the training in order to help them to better understand and to implement their experiences and new knowledge into their daily lives. During this group meeting, experiences in the simulator are described in more detail and are put into perspective. In addition, professionals give information about dementia and some practical tips are shared. At the same time, the caregivers can learn from each other's experiences.

Measures

Table 1 and 2 give an overview of the variables assessed and instruments used at each time point. Short questionnaires (or self-made questions) were specifically chosen in order to reduce the time (about 45 minutes in total) required to complete, because caregivers are typically busy and 82% overburdened.¹ The interviews take about 45 minutes to complete, leading to a time-investment of approximately 90 minutes per measurement per caregiver.

Table 1 Primary outcomes

| Variable | Instrument | T1 | T2 | T3 | T4 |
|---------------------------------|---|----|----|----|----|
| Empathy | Interpersonal Reactivity Index ³¹ | X | X | X | X |
| Caregiver burden | Caregiver Reaction Assessment - Dutch ³³ | X | X | X | X |
| Depressive complaints | Hospital Anxiety and Depression Scale - subscale Depression ³⁵ | X | X | X | X |
| Anxiety complaints | Hospital Anxiety and Depression Scale - subscale Anxiety ³⁵ | X | X | X | X |
| Quality of the relationship | Relationship Quality Index ³⁷ | X | X | X | X |
| | Quality of the Relationship ³⁸ | X | X | X | X |
| Caregiver's sense of competence | Short Sense of Competence Questionnaire ³⁹ | X | X | X | X |

Note. T1, one week before the simulator training; T2, one week after the training; T3, 2.5 months after the training; T4, 15 months after the training.

Outcomes

Primary outcomes

The primary outcomes (Table 1) chosen to assess how effective the Into D'mentia simulator is, are: empathy, caregiver burden, depression, anxiety, the quality of the relationship between caregiver and patient, and caregiver's sense of competence.

To measure empathy, the most important primary outcome, the Interpersonal Reactivity Index (IRI)³¹ is used. The IRI asks subjects to rate 28 items on several empathy-related statements on a 5-point Likert scale ranging from 'does not describe me well' to 'describes me very well'. The 28 items are clustered into four subscales, each made up of seven different items: Perspective Taking, Fantasy, Empathic Concern, and Personal Distress, leading to a multidimensional approach to empathy. The Cronbach's alpha for the subscales ranges from .70 to .76.³²

Caregiver burden is evaluated by the Caregiver Reaction Assessment - Dutch (CRA-D)³³. The CRA-D measures both negative and positive reactions to caregiving. The questionnaire consists of 24 items, clustered into five dimensions: Impact of caregiving on disrupted schedule, Financial problems, Lack of family support, Health problems, and Impact of caregiving on caregiver's self-esteem, with Cronbach's alpha ranging from .62 to .83.³⁴ The subject reports to what extent he or she agrees with the 24 statements on a 5-point scale.

Anxiety and depression are measured using the Hospital Anxiety and Depression Scale (HADS).³⁵ The HADS comprises seven questions for Anxiety and seven questions for Depression and takes two to five minutes to complete. The items are rated on a 4-point scale (0 - 3) and concern anxiety and depression symptoms from the last week. The scores on the subscales are added up and a cut-off score of 8 is used to indicate depressive or anxiety complaints. For

the Anxiety subscale, Cronbach's alpha ranges from .76 to .93, for the Depression subscale it ranges from .72 to .90 in different studies.³⁶

The quality of the relationship between caregiver and patient is evaluated using two questionnaires. The first is the Relationship Quality Index (RQI), which consists of five questions which can be answered on a 7-point Likert scale. The maximum score is 35. A higher score indicates a higher quality relationship.³⁷

The second questionnaire to measure relationship quality is based on the Affectual Solidarity (AS) questionnaire used for the Longitudinal Study of Generations (LSOG),³⁸ which in this study is named Quality of the Relationship (QoR). This questionnaire evaluates two domains: Current relationship quality (QoR-current) (six items), and Change in relationship quality (QoR-change) (five items). The six items of the QoR-current are evaluated on a 4-point scale. Scores range from 6 to 24, with a higher score indicating a better relationship quality. The five items of the QoR-change are statements regarding how much things have changed since the dementia diagnosis of a loved one. The statements are evaluated on a 5-point scale, the total score ranges from 5 to 25, with a higher score indicating a lower relationship quality.

Caregiver's sense of competence is assessed by the Short Sense of Competence Questionnaire (SSCQ), which consists of seven items, rated according to a 5-point Likert scale (1 - 5). The items are clustered into three domains: Lack of satisfaction with the person with dementia as a recipient of care; Lack of satisfaction with one's own performance as a carer; and Consequences of involvement in care for the personal life of the carer. The total score ranges from 7 to 35, with a Cronbach's alpha of .76.³⁹

Secondary outcomes

Secondary outcomes (Table 2) include social reliance (use of social networks and participation), subjective and objective health, life events, quality of life, and quality of sleep. The living situation of the person with dementia will also be assessed.

Social reliance is measured by the Dutch version of the Inventory for Social Reliance. The questionnaire evaluates both the quantitative and qualitative aspects of social support. The quantitative part consists of two items; the number of good friends and the number of acquaintances in the participants' neighborhood. The qualitative part entails 11 items; rated according to a 4-point Likert scale, which cover three aspects of social support: perceived emotional support, actual emotional support, mutual visiting and one rest item.^{40,41}

Subjective health is evaluated by asking the caregivers if they had cognitive, depressive, or anxiety complaints in the last four weeks. The caregivers' objective health is assessed during the semi-structured interviews using the following (separate) measures (relying on self-

report): the number of medications the caregiver personally uses, the number of hospital admissions, visits to the general practitioner, and visits to the hospital in the last month.

To assess life events, the participants answer the following self-made written question concerning the presence and impact of a positive or negative life event 'In the past month, did something happen in your life which had a major impact on you? This may be something either pleasant or sad'. The subjects can choose between 'no' or 'yes, namely..'. If the answer is yes, the next question is what the total impact of the experience is, which the subject can rate according to a 5-point Likert scale ranging from 'very negative impact' to 'very positive impact'.

Quality of life and quality of sleep are both evaluated using visual analogue scales. The participant is asked to rate their quality of sleep and quality of life at 'this' moment in their lives, by putting a cross on a line from 0 to 100.

The living situation of the person with dementia is assessed by asking the caregivers if the person still lives at home or if he or she has been institutionalized.

Possible determinants/confounders

A wide range of possible determinants/confounders (factors in the prediction model and/or covariates) are additionally taken into account, based on what is currently known from the literature about caregivers. These include: sociodemographic variables, medicine use of both caregivers and the people with dementia they care for, and clinical variables regarding the dementia such as the type and time since diagnosis. These data rely on self-report of the informal caregiver. Finally, a couple of qualitative variables are also assessed, e.g. subjective experiences with the simulator (for the intervention group only). Table 3 lists the specific variables assessed and instruments used.

Table 2 Secondary outcomes

| Variable | Instrument/operationalization | T1 | T2 | T3 | T4 | |
|-------------------------------------|---|---|----|----|----|---|
| Social reliance | Inventory for Social Reliance ⁴⁰ | X | X | X | X | |
| Subjective health | Cognitive complaints | Self-made item: 'Before the dementia of your spouse/friend/relative, did you experience cognitive complaints?' Self-made item: 'In the previous month, have you experienced cognitive complaints?' | X | | | |
| | Depressive complaints | Self-made item: 'Before the dementia of your spouse/friend/relative, did you experience depressive complaints?' Self-made item: 'In the previous month, have you experienced depressive complaints?' | X | X | X | X |
| | Anxiety complaints | Self-made item: 'Before the dementia of your spouse/friend/relative, did you experience anxiety complaints?' Self-made item: 'In the previous month, have you experienced anxiety complaints?' | X | X | X | X |
| | | | | | | |
| Objective health | Number of hospital admissions | X | X | X | X | |
| | Number of hospital visits | X | X | X | X | |
| | Number of GP visits | X | X | X | X | |
| Life events | Self-made item concerning the presence and impact of a positive or negative life event: 'Last month, did something happen in your life which had a major impact on you? This may be something either pleasant or sad.' | X | X | X | X | |
| Quality of life | Self-made item concerning the quality of life of the caregivers: 'How would you rate your quality of life on this point in your life?' The subjects answers by putting an X on a line ranging from 0 (very bad) to 100 (very good). | X | X | X | X | |
| Quality of sleep | Self-made item about the quality of sleep: 'Before the dementia of your spouse/friend/relative, how would you have rated your quality of sleep?' The subjects answers by putting an X on a line ranging from 0 (very bad) to 100 (very good). | X | | | | |
| | Self-made item about the quality of sleep: 'How would you have rated your quality of sleep on this point in your life?' The subjects answers by putting an X on a line ranging from 0 (very bad) to 100 (very good). | X | X | X | X | |
| Health and living situation patient | Self-made item concerning the progression of the dementia of the patient: 'How is he or she doing compared to the time of the last interview?' The possible answers are better, the same, or worse. | | X | X | X | |
| | Self-made item concerning the living situation of the patient: 'Has something changed in the living situation of the patient since the last interview?' | | X | X | X | |
| | Self-made item about the concerns of the caregivers about the dementia of the patient: 'Do you have any new concerns about the dementia since the last interview?' | | X | X | X | |

Note. T1, one week before the simulator training; T2, one week after the training; T3, 2.5 months after the training; T4, 15 months after the training.

Table 3 Possible determinants/confounders

| Variable | Operationalization | T1 | T2 | T3 | T4 |
|---|--|----|----|----|----|
| Sociodemographic and clinical variables regarding the caregivers | | | | | |
| Age, gender, education, employment status | | X | | | |
| Medicine use | | X | | | |
| Presence and severity of physical disabilities | Self-made question: 'Do you have any physical disabilities and if so, to what extent do these interfere with caregiving?' | X | | | |
| Presence and severity of psychological disabilities | Self-made question: 'Do you have any psychological disabilities and if so, to what extent do these interfere with caregiving?' | X | | | |
| Variables concerning caregiving | Relationship with the patient with dementia (spouse/daughter/son/something else) | X | | | |
| | Distance to the patient (shares household/walking distance/in the same city/in a different city) | X | | | |
| | Days providing care a week | X | | | |
| | Hours providing care a week | X | | | |
| | Years since first time providing care for this patient | X | | | |
| | Support of professionals (e.g. housekeeper, case-manager) | X | | | |
| | Perceived support of friends or family | X | | | |
| Clinical variables regarding the patient with dementia | | | | | |
| Diagnosis | Alzheimer's disease/Vascular dementia/Parkinson's Disease Dementia/Frontotemporal Dementia/other/unknown | X | | | |
| Time since diagnosis (in years) | | X | | | |
| Medicine use | | X | | | |
| Comorbidities | Physical comorbidities | X | | | |
| | Psychological comorbidities | X | | | |
| Support of professional (e.g. physiotherapist) | | X | | | |

Table 3 Possible determinants/confounders (continued)

| | T1 | T2 | T3 | T4 |
|---|----|----|----|----|
| Self-made items regarding the subjective effectivity of the training* | | | | |
| ‘Does the simulator give an accurate reflection of what a demented person goes through?’ | | | X | X |
| ‘Did the simulator meet your expectations?’ | | | X | X |
| ‘Do you think the simulator is useful?’ | | | X | X |
| ‘Did you feel supported by the experiences and stories of the other participants in the group meeting?’ | | | X | X |
| ‘Did the group meeting meet your expectations?’ | | | X | X |
| ‘Do you think the group meeting is useful?’ | | | X | X |
| ‘Did the whole training (simulator and group meeting together) had a personal impact on you?’ | | | X | X |
| ‘Do you think that the whole training has helped you to be a more effective caregiver?’ | | | X | X |
| ‘Do you think the whole training has helped you to understand your spouse/relative/friend?’ | | | X | X |
| ‘Do you think that you are better prepared for what is going to happen in the future?’ | | | X | X |
| ‘Are you surer of your qualities because of the training?’ | | | X | X |
| ‘Did you learn anything from the training?’ And if yes, what? | | | X | X |
| ‘Do you do anything different in caring because of the training?’ And if yes, what? | | | X | X |
| ‘Do you think the training missed anything?’ And if yes, what? | | | X | X |

Note. T1, one week before the simulator training; T2, one week after the training; T3, 2.5 months after the training; T4, 15 months after the training.

*Questions for the intervention group only.

Planned statistical analyses

SPSS Statistics 22 and/or R will be used for the statistical analyses. Parametric and non-parametric tests will be used to determine if the two groups are comparable at baseline on sociodemographics, dementia-related variables, and outcome measures. Sociodemographic or dementia-related variables that differ will be used as covariates in the subsequent analyses.

Change in outcome measures over time between the groups will be analyzed using Linear Mixed Model analyses, which allows inclusion of all available data (i.e. also those from participants with missing data).

A prediction model for change over time will be established using multilevel analysis. Effects with a 2-tailed $p < .05$ are considered statistically significant. We will correct for multiple comparisons. The qualitative questions in the interviews will be analyzed using frequencies.

Sample size and power calculation

The sample size needed is calculated with G*Power, based on the main research question: Does the simulator training increase the empathy of informal caregivers? Based on an alpha level of .05 and a power of .80, 64 participants per group are needed to be able to detect a medium difference ($d = 0.5$) between the groups. We expect about 10% drop-out during the >1-year follow-up period due to mortality of the caregivers or the persons with dementia, or due to refusal to continue participation. Therefore, we aim to include at least 71 participants in each group; $2 \times 71 = 142$ participants in total.

ETHICS AND DISSEMINATION

Ethical considerations

This study is non-invasive and imposes no risk on either the participating caregivers or the people with dementia. This protocol has been approved by the psychological ethical committees of both the Tilburg School of Social and Behavioral Sciences, Tilburg University, and de Wever (an organization for eldercare) in Tilburg, the Netherlands. Written informed consent is obtained from all participants, in accordance with the Helsinki Declaration (Seoul Revision, 2008). The data are stored anonymously and only the primary researchers (LHJ, REM, and MMS) have access to the data. This study has been registered by the Netherlands Trial Register (NTR); NTR5856.

Dissemination

The results obtained will be disseminated to the scientific and general public by publication in national and international (peer-reviewed) scientific and professional journals, as well as by presentations at conferences and meetings with professionals treating (informal caregivers of) people with dementia. First, a manuscript with the results of the primary study outcomes will be published in a peer-reviewed journal. A separate manuscript will be written regarding the prediction model for change and will also be submitted for publication in a peer-reviewed journal. The data will not be made public, assuring the study participants' privacy. Requests for data sharing will be considered on an individual basis, for appropriate research purposes only, after completion of the trial, and after publication of the primary manuscript.

DISCUSSION

This is the first study in which the effectivity of a mixed virtual reality dementia simulator is extensively tested in caregivers in a controlled trial. While multiple interventions for caregivers have been designed and tested,⁴² this is the first dementia simulator in which caregivers

actually experience what it is like to have dementia, not only on a functional level, but also emotionally and socially. The focus on experience-based learning makes this intervention very practical.

Strong elements of this study are its longitudinal prospective design with multiple assessments. This is a useful addition to the existing effect studies into interventions for caregivers, which usually apply pre-post designs which make it impossible to know if these interventions work in the longer term. In addition, we include both quantitative (questionnaires) and qualitative (semi-structured interviews) measurements. We are aware that there are many variables, but we feel that it is necessary to take them all into account because many factors are involved in caregiver burden and need to be considered in an attempt to ultimately figure out which are important. Also, a control group is included which was not always the case in previous intervention studies with caregivers. The control group makes it possible to attribute the findings to the intervention, instead of to other variables such as elapsed time. A potential limitation is that due to practical reasons the participants were not randomized. The simulator was available for free for five weeks only (after which it was again made available for a financial compensation), in which we deemed it impossible to include enough caregivers for both the intervention and control group. Instead, the groups are recruited consecutively and we aim to statistically control for differing variables using covariates. These practical reasons were mainly of a financial nature; the intervention is freely available for the public at a cost.

The recruitment of the control group took longer than the recruitment of the intervention group, see Figure 2. This is partly due to the fact that our existing networks were depleted once we started the recruitment of the control group, so new networks had to be formed. Another potential reason was that these (control) participants may have been less eager to participate because they had to wait until the end of the study for their compensation (the group meeting).

In conclusion, we hope that this study will determine how effective (or not) the Into D'mentia training is on a variety of variables including empathy and caregiver burden. Furthermore, we believe that it has the potential to contribute to existing knowledge about caregivers. The dementia simulator is expected to be effective in enhancing aspects of well-being of both caregivers and the people with dementia by helping caregivers better understand dementia in a more personal way.

More informal caregivers than ever before are involved in the care for a family member or friend living with dementia. Helping them in their task should be a priority in health care services around the world. At the moment the Into D'mentia training is too expensive for many individual caregivers (the training costs €240,- per person). If it proves to be effective

(on one or more outcomes) the next step would be to do a cost-effectiveness analysis and implement it into standard care, making it available for all caregivers and also for care professionals. The ultimate goal is to assist caregivers in the best possible way in their task of caring for their loved ones with dementia.

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CHAPTER 6

CAN THE MIXED VIRTUAL REALITY SIMULATOR INTO DEMENTIA
ENHANCE EMPATHY AND UNDERSTANDING AND DECREASE
BURDEN IN INFORMAL DEMENTIA CAREGIVERS?

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ABSTRACT

Objective: To evaluate whether the mixed virtual reality dementia simulator training Into D'mentia increased informal caregivers' understanding for people with dementia, their empathy, sense of competence, relationship quality with the care receiver, and/or decreased burden, depression, and anxiety.

Methods: A quasi-experimental longitudinal study with an intervention group ($n = 145$) and a control group ($n = 56$) was conducted. All participants were informal caregivers of people with dementia. They completed six questionnaires, and semi-structured interviews one week before, one week after, 2.5 months, and 15 months after the training. Data were analyzed on both group and individual level, using Linear Mixed Model analyses and Reliable Change Indices.

Results: Eighty-five percent of the participants in the intervention group found the intervention useful. Seventy-six percent said they had changed their approach to caregiving and 61% stressed that the intervention increased their understanding of dementia. No significant differences were found between the two groups over time regarding empathy, sense of competence, relationship quality with the care receiver, burden, depression, and anxiety, at either group or individual level.

Conclusion: Caregivers indicated that the Into D'mentia intervention improved their understanding of dementia, that they had learned to be more patient, to take things more slowly, and to focus on positive aspects of caregiving. However, no significant change was found on the variables assessed via the questionnaires. Future research can consider enriching this intervention with other aspects like more educational material, more simulations, and group sessions, tailored to the individual caregiver and his/her situation, and examine if these new interventions yield change on questionnaires. These new, more personalized interventions for dementia caregivers could help caregivers better understand the persons with dementia they care for, to ultimately enhance the well-being of both caregivers and persons with dementia.

INTRODUCTION

Caregiving can be very burdensome for informal caregivers of people with dementia, and may lead to various deleterious consequences, including poorer psychological health.¹ In order to diminish these negative effects, several interventions have been developed.² However, few interventions have attempted to increase the caregiver's understanding of, and empathy for, people with dementia in an attempt to reduce burden, while the benefits of increasing both are thought to be beneficial for professional and informal carers,³⁻⁵ and for the person they care for.^{5,6} The mixed virtual reality Into D'mentia simulator,⁷ developed in 2010, aims to fill this research gap.

Understanding and knowledge of dementia enable caregivers to deliver high quality care, and are essential for caregivers to be able to meet the patient's health care needs,⁵ and can diminish communication problems between the caregiver and the person with dementia.⁸ This could in turn reduce caregiver burden and improve relationship quality.⁹ Existing interventions have mostly focused on enhancing knowledge, and utilized written materials, and information about coping strategies. Overall, these interventions are only moderately effective in alleviating burden and depression.¹⁰ Caregivers may need more understanding (instead of only knowledge) to accurately appreciate the patients, experience of the problem, and in turn be able to meet the patient's health care needs. To reach a higher level of understanding, caregivers might need to look at things from the person with dementia's perspective.⁵

This links to cognitive empathy; the ability to understand the other persons, perspective or Theory of Mind, and (to a lesser extent) to affective empathy; feeling what another person feels.¹¹ Cognitive and affective empathy may have different influences on aspects of well-being of informal dementia caregivers. Cognitive empathy has been positively associated with lower stress appraisal, lower threat appraisal, and lower levels of depression among informal caregivers.^{4,12} Affective empathy has been found to be associated with higher stress appraisal, less life satisfaction, and more anxiety symptoms.^{4,12} These findings suggest that, in addition to enhancing understanding, the intervention's focus should be on enhancing cognitive empathy (and/or reducing affective empathy), to enhance the caregivers' lives.

To date, only two interventions are (partially) aimed at heightening caregivers' empathy; the web-based STAR (Skills Training And Reskilling) e-learning course¹³ and the 13 minute virtual reality movie of Through the D'mentia Lens (TDL),¹⁴ both of which were moderately effective in heightening (cognitive) empathy. However, both studies used small study samples, and the study about the TDL intervention omitted a control group. While the results are promising, no thorough (longitudinal) study incorporating both an intervention and a control group, has

attempted to heighten understanding of and empathy for persons with dementia in order to enhance the caregivers' lives.

In 2010, the mixed virtual reality simulator Into D'mentia was developed, in which dementia caregivers experience what it is like to have dementia.⁷ The simulator's goal is to increase understanding of, and empathy for, people with dementia in informal caregivers by experiential learning. Experiential learning is learning in which the learner is directly in touch with the realities being studied, instead of only reading, hearing, or writing about it¹⁵ and can be achieved by (virtual or augmented) simulation.¹⁶ Simulation training to enhance understanding and empathy has been found to be effective for health care students,¹⁷ but has to date not been thoroughly studied in experimental studies with informal caregivers.

The primary aim of the current study was to examine if the Into D'mentia training increased understanding of dementia and cognitive empathy (at one week, 2.5 months, and 15 months after the intervention) in informal caregivers. The secondary aims were to examine if the Into D'mentia training decreased caregiver burden, depression, and anxiety, and/or enhanced sense of competence and relationship quality with the care receiver. However, the caregiver population is very heterogeneous; caregivers differ from each other on a number of caregiver-related variables (e.g. age, sex, educational level), care receiver variables (e.g. time since diagnosis), and background variables (e.g. time spent on caregiving, whether or not they live with the care receiver). In addition, caregivers differ in their baseline empathy levels. Due to the heterogeneous nature of the group we did not expect the intervention to have the same effects for every caregiver, therefore both group and individual analyses were executed.

DESIGN AND METHODS

Study design

The current study is a quasi-experimental longitudinal investigation into the effectiveness of the Into D'mentia simulator. The outcome variables were assessed at four time points: one week before the Into D'mentia training (T1), one week after the training (T2), 2.5 months after the training (T3), and 15 months after the training (T4) to examine both short and long term effects. The published protocol of the study¹⁸ describes the method in greater detail.

Participants

An intervention and control group, group-matched on sex and level of education took part. All participants were adult informal caregivers who spent at least eight hours per week on caregiving for a relative, spouse, or friend with dementia who lived at home. The inclusion and exclusion criteria were the same for both groups, while the controls (an attention-only

group) did not experience the simulator training. None of the participants or their care receivers were prohibited from usual care.

The recruitment of the intervention group started in July 2014 and ended in August 2014, during which 192 participants were screened for eligibility and 145 were included. One participant did not complete T2, and 20 participants did not complete T3. At T4, 80 participants dropped out, leaving 65 participants at the final time point. The recruitment of the control group started in May 2015 and ended in January 2017, in which 75 participants were screened for eligibility and 56 were included. Three participants did not complete T2, and 13 participants did not complete T3. At T4, 34 participants dropped out, leaving 22 participants at this time point. The participants who did not complete an assessment without giving reasons why, were invited to take part in the following measurement(s), so it is possible that a participant did not complete T2, but did complete T3. All available data were analyzed using Linear Mixed Models analyses. Supplementary Figure S1 shows the flowchart of participants.

Table 1 shows the participant characteristics and pre-intervention scores on the outcome variables. Mean age was 59.6 ($SD = 11.9$) in the intervention group and 63.8 ($SD = 11.8$) in the control group, which is a small, but significant difference ($p = .026$). Most participants were female (79.3% in the experimental group and 76.8% in the control group); and most were highly educated (48.2% and 51.8% in the groups respectively). The groups did not differ on these latter two sociodemographic variables. However, participants in the control group spent significantly more time on providing care a week ($p = .001$), more of them lived with their care receiver ($p = .002$), and the control group consisted of a higher proportion of spouses than the intervention group ($p = .025$).

Table 1 Participant characteristics

| | | Intervention group (n = 145) | Control group (n = 56) | Test-value ^a | p-value |
|--|--------|---------------------------------|---------------------------|-------------------------|---------|
| Characteristics of the informal caregivers | | | | | |
| Age | | 59.6 ± 11.9 | 63.8 ± 11.8 | 2.250 | .026* |
| Male sex | | 30, 20.7% | 13, 23.2% | 0.153 | .704 |
| Level of education ^b | Low | 23, 15.9% | 7, 12.5% | 0.407 | .816 |
| | Medium | 52, 35.9% | 20, 35.7% | | |
| | High | 70, 48.2% | 29, 51.8% | | |
| Hours providing care a week | | 47.2 ± 60.1 | 78.6 ± 65.4 | -3.232 | .001** |
| Relationship with the care receiver | Spouse | 52, 35.9% | 30, 53.6% | 7.415 | .025* |
| | Child | 67, 46.2% | 23, 41.1% | | |
| | Other | 26, 17.9% | 3, 5.3% | | |
| Cohabiting with the care receiver (n, %yes) | | 46, 32.2% | 32, 57.1% | 10.532 | .002** |
| Characteristics of the persons with dementia | | | | | |
| Age | | 78.8 ± 8.4 | 78.1 ± 8.0 | -0.551 | .583 |
| Male sex | | 61, 42.7% | 26, 47.3% | 0.344 | .632 |
| Dementia diagnosis | AD | 86, 59.3% | 30, 53.6% | 2.150 | .708 |
| | VaD | 23, 15.9% | 12, 21.4% | | |
| | PD | 3, 2.1% | 1, 1.8% | | |
| | Other | 8, 5.5% | 2, 3.6% | | |
| | NDD | 25, 17.2% | 11, 19.6% | | |
| Time since diagnosis in years | | 3.6 ± 2.6 | 2.6 ± 2.2 | 1.907 | .058 |
| Pre-intervention scores on the questionnaires | | | | | |
| IRI - Perspective Taking ^c | | 17.7 ± 4.0 | 17.4 ± 4.4 | 0.498 | .619 |
| IRI - Empathic Concern ^c | | 17.8 ± 4.3 | 17.8 ± 3.9 | -0.026 | .980 |
| HADS - Depression ^d | | 4.8 ± 4.2 | 5.5 ± 3.5 | -1.113 | .268 |
| HADS - Anxiety ^d | | 6.2 ± 3.8 | 7.8 ± 4.3 | -2.672 | .008** |
| CRA - Disruption ^e | | 2.9 ± 0.9 | 3.5 ± 0.8 | -4.303 | <.001** |
| CRA - Health ^e | | 2.4 ± 0.8 | 3.0 ± 0.9 | -4.609 | <.001** |
| CRA - Support ^e | | 2.3 ± 0.6 | 2.7 ± 0.8 | -3.358 | .001** |
| CRA - Self-esteem ^e | | 3.8 ± 0.6 | 3.7 ± 0.6 | 1.139 | .256 |
| CRA - Finances ^e | | 2.3 ± 0.6 | 2.6 ± 0.8 | -2.493 | .014* |
| RQI ^f | | 31.6 ± 7.9 | 29.4 ± 8.7 | 1.637 | .103 |
| QoR - Current ^g | | 13.2 ± 2.9 | 13.4 ± 3.0 | -0.393 | .695 |
| SSCQ ^h | | 27.3 ± 5.0 | 24.1 ± 5.5 | 3.851 | <.001** |

Note. Values are presented as $M \pm SD$ or $n, (\%)$.

AD, Alzheimer's dementia; CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; NDD, No Differential Diagnosis; PD, Dementia associated with Parkinson's Disease; QoR, Quality of Relationship; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire; VaD, Vascular Dementia.

^aTest values for continuous outcomes: t -values for normally distributed variables and standardized statistics for Mann-Whitney U -tests for non-normally distributed variables; for categorical values: Pearson χ^2 values. ^bEducational level according to Verhage [35], recoded as low (1 - 4), medium (5), or high (6 - 7). ^cScore range 0 - 28. ^dScore range 0 - 21. ^eScore range 1 - 5. ^fScore range 7 - 42. ^gScore range 4 - 20. ^hScore range 7 - 35.

* $p < 0.05$, ** $p < 0.01$.

There were no differences on the sociodemographic variables between those who completed T3 and those who dropped out before T3 in either group. Regarding the outcome variables, participants of the intervention group who dropped out, had significantly higher anxiety scores at T1 ($M = 8.3, SD = 3.8$) than those who completed T3 ($M = 5.8, SD = 3.7$), $p = .004$, and they had better perceived social support (CRA - Support) ($M = 1.9, SD = 0.9$, vs $M = 2.3, SD = 0.8$), $p = .035$. Regarding the control group, the participants who completed T3 had significantly fewer health problems (CRA - Health) than those who dropped-out before T3 ($M = 2.8, SD = 0.9$, vs $M = 3.6, SD = 0.8$), $p = .024$. No other significant differences between those who did and did not complete T3 were found. Supplementary Table S1 shows all comparisons.

There were no differences on the sociodemographic or outcome variables between the participants who completed T4 and those who dropped out before T4 in the intervention group. Regarding the control group, the participants who completed T4 had significantly fewer financial problems (CRA - Finances) at T1 than those who dropped out before T4 ($M = 2.4, SD = 0.9$, vs $M = 2.9, SD = 0.7$), $p = .039$. No other differences were found. Supplementary Table S2 shows all comparisons.

Intervention

The intervention consisted of a mixed virtual reality dementia simulator training, an individual conversation with the trainer immediately after the simulation, and a group meeting with 8 - 12 other participants one to two weeks later. In the simulator, the participants experienced what it is like to have dementia, as if they walk in the patients' shoes. During the group meeting, the experiences in the simulator were shared and put in perspective. In addition, practical tips and tricks were shared, and the caregivers could learn from each other's caregiving experiences. The control group was an attention only group, and received no intervention. The protocol describes the intervention in greater detail.¹⁸

Outcome measures

Semi-structured interview

During the semi-structured interviews at T3 and T4, several questions were asked (to the intervention group only) about the overall experienced usefulness of the intervention, if the caregivers' understanding of the person with dementia had changed, and if the caregivers had learned anything from the intervention (see Table 2).

Table 2 Results of the interview (at T3 and T4)

| Part of the training evaluated | | T3 | T4 |
|---|-------------------------|-------|-------|
| Simulator | | | |
| 'Does the simulator give an accurate reflection of what a person with dementia goes through?' | % Yes | 82.2% | 79.7% |
| | % A bit | 13.1% | 17.2% |
| | % No | 4.7% | 3.1% |
| 'Did the simulator meet your expectations?' | % Yes | 46.8% | 73% |
| | % A bit | 18.8% | 20.7% |
| | % No | 15.6% | 6.3% |
| | % I had no expectations | 18.8% | |
| 'Do you think the simulator is useful?' | % Yes | 85.2% | 87.1% |
| | % A bit | 8.6% | 8.1% |
| | % No | 6.2% | 4.8% |
| Group meeting with other participants after the simulation | | | |
| 'Did you feel supported by the experiences and stories of the other participants in the group meeting?' | % Yes | 79.0% | 62.5% |
| | % A bit | 14.0% | 29.7% |
| | % No | 7.0% | 7.8% |
| 'Did the group meeting meet your expectations?' | % Yes | 61.2% | 58.0% |
| | % A bit | 24.0% | 38.7% |
| | % No | 11.6% | 3.3% |
| | % I had no expectations | 3.2% | |
| 'Do you think the group meeting is useful?' | % Yes | 82.2% | 73.4% |
| | % A bit | 11.6% | 23.4% |
| | % No | 6.2% | 3.2% |
| Whole training (simulator and group meeting combined) | | | |
| 'Did the whole training (simulator and group meeting together) had a personal impact on you?' | % Yes | 70.5% | 78.1% |
| | % No | 29.5% | 21.9% |
| 'Do you think that the whole training helps you to be a more effective caregiver?' | % Yes | 65.9% | 46.8% |
| | % A bit | 9.3% | 43.8% |
| | % No | 24.8% | 9.4% |
| 'Do you think the whole training has helped you to understand your spouse/relative/friend?' | % Yes | 60.5% | 54.7% |
| | % A bit | 14.7% | 37.5% |
| | % No | 24.8% | 7.8% |
| 'Do you think that you are better prepared for what is going to happen in the future?' | % Yes | 37.2% | 35.9% |
| | % A bit | 18.6% | 46.9% |
| | % No | 44.2% | 17.2% |
| 'Are you surer of your qualities because of the training?' | % Yes | 56.3% | 37.5% |
| | % A bit | 15.6% | 45.3% |
| | % No | 28.1% | 17.2% |
| 'Did you learn anything from the training?' | % Yes | 93.0% | 85.9% |
| | % No | 7.0% | 14.1% |
| 'Do you do anything different in caring because of the training?' | % Yes | 76.0% | 58.7% |
| | % No | 24.0% | 41.3% |

Questionnaires - Empathy

Two subscales of the Interpersonal Reactivity Index (IRI)¹⁹ were used to measure empathy; Perspective Taking (PT) and Empathic Concern (EC). PT measures cognitive empathy, the tendency to take the psychological point of view of others, akin to the concept Theory of mind, Cronbach's alpha = .670. EC measures affective empathy, the ability to feel for others, Cronbach's alpha = .655. Both subscales consist of seven items, each rated on a 5-point Likert scale (0 - 4), with a maximum score of 28 per subscale.²⁰

Questionnaires - Secondary outcome measures

The other outcomes were caregiver burden, measured using the Caregiver Reaction Assessment - Dutch (CRA-D),²¹ subscales Impact of caregiving on disrupted schedule, Health problems, Lack of family support, Self-esteem, and Financial problems; depression and anxiety, both measured with the Hospital Anxiety and Depression Scale (HADS);²² relationship quality, measured with both the Relationship Quality Index (RQI)²³ and the Quality of the relationship - current (QoR-current);²⁴ and sense of competence, measured with the Short Sense of Competence Questionnaire (SSCQ).²⁵

Study procedure

All participants completed a semi-structured interview and a questionnaire booklet at each measurement point. Trained neuropsychologists, who were not part of the intervention, conducted the (individual) semi-structured interviews with the caregivers. Written informed consent was obtained. Due to the content of the semi-structured interviews, the interviewers could not be blinded. However, the participants filled out the questionnaires themselves at home minimizing the interviewers' influence. The participants were blind to the assigned groups; the groups were unaware of the other groups' existence. The control group was debriefed after the last measurement and offered an educational group meeting to compensate for their contribution.

Statistical analyses

Statistical analyses were performed using SPSS Statistics 22,²⁶ and R software, nlme package.²⁷ Differences between the groups on demographic variables and pre-intervention scores were examined using independent samples *t*-tests and χ^2 tests.

Semi-structured interview

The interview questions were analyzed using frequencies.

Questionnaires - Group change

Comparative analyses between the two groups were conducted using Linear Mixed Model (LMM) analyses. For all outcome measures separate models were built, using a step-up strategy.²⁸ The restricted maximum likelihood estimate (REML) method was used to estimate the model parameters and the Aikake Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used to estimate model fit. For each model, the random effect was the intercept, and the fixed effects were group (intervention versus control), time, and the time by group interaction. A quadratic effect of time was tested, but found to be neither significant, nor improving model fit, and therefore not included. No random slopes were added because these did not improve model fit. A first-order autoregressive covariance structure (AR1) at level 1 and a Scaled Identity matrix at level 2 (because there was only one random effect) were selected because these provided the best fit.

The groups were matched on sex and level of education, but differed significantly on the variables age, cohabiting with the care receiver, hours spent on care a week, and type of the relationship with the care receiver (Table 1). These variables (accompanied by their interaction with time) were added consecutively to the full model (described above), to examine if these improved the model fit. The model fit was estimated by computing the Likelihood Ratio Statistic (using the log-likelihood based on the maximum likelihood (ML) and degrees of freedom).²⁸ The final models included the covariates age, cohabiting with the person with dementia, and hours spent on care, since these models provided the best fit.

Questionnaires - Individual change

The Reliable Change Index (RCI) was computed as an indication for clinical significant change,²⁹ from both T1-T2, T1-T3, and T1-T4. The RCI was based on a 90% Confidence Interval, which corresponds with a cut-off value of 1.65.

P-values lower than .05 were considered statistically significant. However, to adjust for multiple significance testing, the Benjamini-Hochberg procedure (false discovery rate, FDR) was applied³⁰ in case of significant results. This procedure is less strict than the Bonferroni correction, and recommended for health-related studies.³¹

RESULTS**Semi-structured interview**

Table 2 shows the answers and the questions, asked during the semi-structured interviews with the caregivers in the intervention group at T3 and T4. At T3, most caregivers found the simulation and group meeting useful (85.2% and 82.2% respectively). Most (65.9%) also thought that the training (simulator and group meeting combined) helped them to be a

better caregiver; 60.5% thought the training has helped them to better understand their care receiver; and 56.3% were surer of their qualities after the training. Ninety-three percent of the caregivers said they learned something from the training. They indicated that they now have a better understanding of dementia; and that they are more aware of the fact that they need to have more patience with the care receiver. Seventy-six percent indicated that they do something different in caring for their loved one. The caregivers most often mentioned that after the intervention, they took things more slowly; they lowered their expectations of the care receiver; they were learning to let go of disagreements, rather than starting or continuing arguments; and that they focused more on the positive side of the caregiving experience and on the things that go well, instead of focusing only on the losses.

Questionnaires - Group change

Table 3 shows the means and standard deviations for all questionnaires, on each time point, and the results of the LMM analyses. No significant differences were found between the groups over time, for either primary outcome variable; PT, $\beta = 0.218$, $p = .381$; EC, $\beta = 0.047$, $p = .862$. For the secondary outcome variables, also no significant results were found.

Questionnaires - Individual change

Table 4, 5, and 6 show the RCIs for both groups, and all outcome measures, for T1-T2, T1-T3, and T1-T4 respectively. Approximately the same number of participants of both groups show reliable change (both positively and negatively) on all outcome measures, on all time intervals.

Table 3 Differences between the groups on all outcome measures over time (Linear Mixed Models analyses)

| | Intervention group | | | | Control group | | | | β (SE) | p-value |
|---------------------------------------|--------------------|------------|------------|------------|---------------|------------|-------------|-------------|---------------|---------|
| | T1 | T2 | T3 | T4 | T1 | T2 | T3 | T4 | | |
| <i>n</i> | 145 | 144 | 125 | 65 | 56 | 53 | 43 | 22 | - | - |
| IRI - Perspective Taking ^a | 17.7 ± 4.0 | 18.0 ± 3.8 | 17.6 ± 4.0 | 17.4 ± 4.7 | 17.4 ± 4.4 | 17.0 ± 3.6 | 17.2 ± 3.3 | 18.6 ± 4.2 | 0.218 (0.25) | .381 |
| IRI - Empathic Concern ^a | 17.8 ± 4.3 | 18.1 ± 4.3 | 17.9 ± 4.2 | 18.0 ± 4.7 | 17.8 ± 3.9 | 17.2 ± 3.8 | 17.9 ± 3.4 | 18.4 ± 3.8 | 0.047 (0.27) | .862 |
| HADS - Depression ^b | 4.8 ± 4.2 | 4.7 ± 4.1 | 5.3 ± 4.6 | 5.5 ± 4.7 | 5.5 ± 3.5 | 6.0 ± 4.0 | 5.8 ± 4.0 | 6.5 ± 3.6 | -0.008 (0.18) | .963 |
| HADS - Anxiety ^b | 6.2 ± 3.8 | 5.9 ± 3.9 | 6.2 ± 4.1 | 6.7 ± 4.1 | 7.8 ± 4.3 | 7.5 ± 4.3 | 7.6 ± 4.2 | 8.8 ± 5.4 | 0.020 (0.18) | .912 |
| CRA - Disruption ^c | 2.9 ± 0.9 | 2.8 ± 0.9 | 3.0 ± 0.9 | 3.0 ± 1.0 | 3.5 ± 0.8 | 3.5 ± 0.7 | 3.5 ± 0.8 | 3.7 ± 0.6 | -0.011 (0.04) | .785 |
| CRA - Health ^c | 2.4 ± 0.8 | 2.3 ± 0.8 | 2.5 ± 0.8 | 2.6 ± 0.9 | 3.0 ± 0.9 | 3.0 ± 0.9 | 2.9 ± 0.8 | 3.2 ± 0.9 | -0.036 (0.04) | .417 |
| CRA - Support ^c | 2.3 ± 0.8 | 2.3 ± 0.8 | 2.4 ± 0.8 | 2.4 ± 0.9 | 2.7 ± 0.8 | 2.7 ± 0.8 | 2.7 ± 0.8 | 2.8 ± 0.8 | -0.044 (0.04) | .241 |
| CRA - Self-esteem ^c | 3.8 ± 0.6 | 3.8 ± 0.5 | 3.8 ± 0.6 | 3.7 ± 0.6 | 3.7 ± 0.6 | 3.6 ± 0.6 | 3.6 ± 0.7 | 3.7 ± 0.7 | 0.018 (0.02) | .544 |
| CRA - Finances ^c | 2.3 ± 0.6 | 2.3 ± 0.7 | 2.4 ± 0.8 | 2.6 ± 0.8 | 2.6 ± 0.8 | 2.7 ± 0.9 | 2.6 ± 0.9 | 3.0 ± 1.0 | -0.062 (0.05) | .199 |
| RQI ^d | 31.6 ± 7.9 | 31.4 ± 8.1 | 31.3 ± 8.0 | 31.0 ± 9.0 | 29.4 ± 8.7 | 30.0 ± 8.1 | 29.9 ± 10.1 | 28.9 ± 10.0 | 0.073 (0.46) | .876 |
| QoR - Current ^e | 13.2 ± 2.9 | 13.6 ± 3.0 | 13.1 ± 3.0 | 12.5 ± 3.0 | 13.4 ± 3.0 | 13.8 ± 2.8 | 13.4 ± 3.2 | 13.3 ± 3.6 | 0.139 (0.16) | .395 |
| SSCQ ^f | 27.3 ± 5.0 | 27.3 ± 4.5 | 26.7 ± 4.9 | 27.6 ± 8.3 | 24.1 ± 5.5 | 24.7 ± 4.6 | 24.2 ± 5.4 | 24.0 ± 6.2 | 0.275 (0.38) | .470 |

Note: Values are presented as *M* ± *SD* unless indicated otherwise. The intercept was modeled as a random effect, all the other effects were modeled as fixed effects. Age, cohabiting with the person with dementia, and hours spent on care were added as covariates. The Akaike Information Criterion indices for model fit were: 3,171.021 and 2,345.346 for IRI - Perspective Taking and IRI - Empathic Concern, respectively.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; QoR, Quality of Relationship; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

^aScore range 0 - 28; ^bScore range 0 - 21; ^cScore range 1 - 5; ^dScore range 7 - 42; ^eScore range 4 - 20; ^fScore range 7 - 35.

Table 4 Reliable Change Indices for all outcome measures and both groups, T1-T2

| | Intervention group | | Control group | |
|--------------------------|--|--|--|--|
| | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) |
| IRI - Perspective Taking | 2 (of 141) | 9 (of 141) | 3 (of 51) | 4 (of 51) |
| IRI - Empathic Concern | 7 (of 140) | 5 (of 140) | 1 (of 50) | 2 (of 50) |
| HADS - Depression | 7 (of 130) | 6 (of 130) | 5 (of 50) | 3 (of 50) |
| HADS - Anxiety | 5 (of 134) | 5 (of 134) | 1 (of 50) | 4 (of 50) |
| CRA - Disruption | 4 (of 139) | 5 (of 139) | 3 (of 50) | 2 (of 50) |
| CRA - Health | 5 (of 139) | 5 (of 139) | 3 (of 52) | 4 (of 52) |
| CRA - Support | 7 (of 139) | 2 (of 139) | 1 (of 47) | 4 (of 47) |
| CRA - Self-esteem | 6 (of 137) | 5 (of 137) | 1 (of 52) | 2 (of 52) |
| CRA - Finances | 12 (of 138) | 16 (of 138) | 6 (of 53) | 6 (of 53) |
| RQI | 8 (of 125) | 4 (of 125) | 2 (of 49) | 1 (of 49) |
| QoR - Current | 5 (of 110) | 12 (of 110) | 3 (of 44) | 4 (of 44) |
| SSCQ | 5 (of 138) | 3 (of 138) | 2 (of 53) | 3 (of 53) |

Note. RCIs were based on a 90% confidence interval. All scores were recoded so that negative change indicates change for the worse, e.g. less empathy, more depression, more burden, and positive change indicates change for the better, e.g. less depression, more empathy, etc.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; QoR, Quality of Relationship; RCI, Reliable Change Index; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

Table 5 Reliable Change Indices for all outcome measures and both groups, T1-T3

| | Intervention group | | Control group | |
|--------------------------|--|--|--|--|
| | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) |
| IRI - Perspective Taking | 4 (of 123) | 2 (of 123) | 0 (of 40) | 2 (of 4) |
| IRI - Empathic Concern | 4 (of 119) | 6 (of 119) | 1 (of 40) | 2 (of 40) |
| HADS - Depression | 10 (of 112) | 2 (of 112) | 1 (of 43) | 4 (of 43) |
| HADS - Anxiety | 4 (of 117) | 3 (of 117) | 2 (of 43) | 2 (of 43) |
| CRA - Disruption | 8 (of 121) | 6 (of 121) | 5 (of 42) | 0 (of 42) |
| CRA - Health | 8 (of 122) | 4 (of 122) | 4 (of 42) | 2 (of 42) |
| CRA - Support | 11 (of 120) | 7 (of 120) | 4 (of 39) | 0 (of 39) |
| CRA - Self-esteem | 4 (of 120) | 6 (of 120) | 4 (of 41) | 2 (of 41) |
| CRA - Finances | 17 (of 120) | 6 (of 120) | 4 (of 43) | 3 (of 43) |
| RQI | 4 (of 107) | 5 (of 107) | 1 (of 38) | 2 (of 38) |
| QoR - Current | 4 (of 98) | 4 (of 98) | 3 (of 33) | 1 (of 33) |
| SSCQ | 4 (of 121) | 2 (of 102) | 3 (of 43) | 1 (of 43) |

Note. RCIs were based on a 90% confidence interval. All scores were recoded so that negative change indicates change for the worse, e.g. less empathy, more depression, more burden, and positive change indicates change for the better, e.g. less depression, more empathy, etc.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; QoR, Quality of Relationship; RCI, Reliable Change Index; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

Table 6 Reliable Change Indices for all outcome measures and both groups, T1-T4

| | Intervention group | | Control group | |
|--------------------------|--|--|--|--|
| | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) | <i>n</i> reliably changed (negatively) | <i>n</i> reliably changed (positively) |
| IRI - Perspective Taking | 7 (of 62) | 2 (of 62) | 0 (of 20) | 1 (of 20) |
| IRI - Empathic Concern | 2 (of 60) | 4 (of 60) | 1 (of 20) | 1 (of 20) |
| HADS - Depression | 7 (of 65) | 3 (of 65) | 4 (of 20) | 1 (of 20) |
| HADS - Anxiety | 5 (of 66) | 1 (of 66) | 4 (of 20) | 1 (of 20) |
| CRA - Disruption | 4 (of 63) | 2 (of 63) | 0 (of 21) | 0 (of 21) |
| CRA - Health | 4 (of 65) | 1 (of 65) | 2 (of 21) | 0 (of 21) |
| CRA - Support | 3 (of 65) | 2 (of 65) | 0 (of 19) | 0 (of 19) |
| CRA - Self-esteem | 6 (of 62) | 1 (of 62) | 2 (of 20) | 1 (of 20) |
| CRA - Finances | 5 (of 62) | 1 (of 65) | 2 (of 21) | 2 (of 21) |
| RQI | 4 (of 56) | 1 (of 65) | 1 (of 20) | 1 (of 20) |
| QoR - Current | 5 (of 510) | 1 (of 51) | 2 (of 18) | 0 (of 18) |
| SSCQ | 0 (of 63) | 2 (of 63) | 1 (of 21) | 1 (of 21) |

Note. RCIs were based on a 90% confidence interval. All scores were recoded so that negative change indicates change for the worse, e.g. less empathy, more depression, more burden, and positive change indicates change for the better, e.g. less depression, more empathy, etc.

CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; QoR, Quality of Relationship; RCI, Reliable Change Index; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire.

DISCUSSION

The current study assessed whether the Into Dementia simulator training could heighten empathy for, and understanding of, people with dementia among informal caregivers, at both group and individual level. In addition, it was examined whether the intervention could decrease symptoms of depression, anxiety, and burden and/or enhance sense of competence, and/or relationship quality between caregiver and care receiver. Most participants who underwent the intervention found it useful, indicated that it had helped to increase their understanding of dementia, and said that it had made them a more effective caregiver. However, no significant differences emerged between the two groups (intervention versus control) on the other outcome measures, assessed via questionnaires.

For the caregivers who underwent the training, the understanding of dementia was heightened, almost all caregivers indicated that they had learned something from the training, and most also stated that they had changed the way they care for the person with dementia. While social desirability response bias has to be taken into account when interpreting these findings, these results are promising because how caregivers experience caregiving is crucial and arguably more important than change on a questionnaire.³² Heightening caregivers'

understanding for people with dementia can be beneficial for both caregivers and people with dementia. For the people with dementia, caregivers' heightened understanding can lead to feelings of being important, and to a better connection or relationship with the caregiver. In addition, adequate understanding of the problems of the person with dementia can enable the caregivers in meeting the patient's health care needs.⁵ For the caregivers, enhanced understanding can lead to fewer communication problems,⁸ which in turn can lead to a better relationship and enhanced well-being. In addition, the caregivers claim that they had changed the way they care for the person with dementia; they take things more slowly, and they learned to let go of disagreements, rather than starting or continuing arguments. This is also promising, because this can lead to a more positive living situation for both caregiver and person with dementia.

We did not find significant change on the included questionnaires. The two previous intervention studies focused on increasing empathy (measured with the IRI) in dementia caregivers, found significant increases at group level; the web-based skills training (STAR)¹³ on both cognitive and affective empathy; and Through the D'mentia Lens (TDL)¹⁴ on cognitive empathy. However, these interventions are not directly comparable to ours: the intervention group of the STAR training consisted of both informal caregivers and volunteers in dementia care, had a small sample size (intervention group, $n = 27$; and control group, $n = 32$), and used a web-based portal, consisting of skill-building modules, and peer- and expert groups for support and information exchange, and no simulation techniques to heighten empathy. The TDL ($n = 35$) did use simulation techniques (using virtual reality glasses) and an e-learning course, but omitted a control group. The change in cognitive empathy in that study could therefore be due to other factors (e.g. the passing of time) instead of to the intervention per se.

A systematic review¹⁷ suggested that simulation may be an appropriate educational methodology for developing understanding, empathy, and/or empathic behaviors in healthcare students. However, there was a large variety in the effect sizes among the reviewed studies. The interventions showing larger effects included a range of educational features, such as role-playing, and accompanying feedback. The Into D'mentia intervention did include a group session in which best practices were shared, but role-playing and feedback were not included. Maybe if the Into D'mentia intervention is extended by including more educational aspects, change on the questionnaires would emerge.

The absence of change on the questionnaires between the groups over time in our study could be due to a number of other issues. First, the intervention consisted of one short (20 minute) simulation experience, and one (half day) group meeting. Several caregivers noted during the interviews that they would have liked more group meetings or a booster session, including more support, and practical tips and tricks to help them in their caregiving tasks. Secondly,

the simulation focusses on the beginning stage(s) of (primarily Alzheimer's) dementia. However, the majority of the caregivers in the intervention group had been a caregiver for more than a year and several caregivers noted that the simulation was not applicable to their situation anymore, because the dementia of their loved one had progressed and other dementia-associated problems had arisen. It is possible that changes on the questionnaires would emerge if the Into D'mentia intervention included more simulation and group sessions specifically designed for specific types of dementia (e.g. Alzheimer's dementia, Vascular dementia) and the different stages (mild, moderate, severe) as the dementia progresses; more educational elements; and more specific tips and tricks that they could use in their day-to-day care for their loved one with dementia. Third, in the Netherlands, there are a number of supportive services available for caregivers, which are viewed as 'usual care'. As a consequence, the control participants in our study also had support, which may have resulted in a limited contrast between the intervention and control group. However, it would have been unethical and unfeasible to deprive our participants of usual care.

On the other hand, the lack of change on the questionnaires could be due to methodological issues. First, due to practical issues, the participants were not randomized.¹⁸ In order to overcome this, the groups were (successfully) group-matched on sex and level of education. However, the control group was slightly (but significantly) older than the intervention group, spent more hours on caregiving, and experienced more anxiety and burden than the intervention group. In addition, the control group was considerably smaller than the intervention group, leading to lower statistical power. This is due to difficulties in recruiting control participants; many caregivers in our recruitment region at the time the recruitment started, were already taking part in other scientific studies including informal caregivers and were as such not eligible for (or willing to participate in) our control group. Also, there was a large dropout rate, leading to even smaller sample sizes at the last measurement. In addition, while the caregivers who dropped out and completed all measurements did not differ on most of the measured variables, they could be different in unobserved characteristics. Another possible explanation lies in the questionnaires used. To measure empathy, we used the IRI, arguably the most-used measure to assess empathy, especially in the general (not professional or medical) population. However, despite its wide usage, some of our caregivers found the questions difficult to answer, even after further clarification of specific questions that was given to them if asked for during the interviews. In addition, some researchers argue that the IRI measures trait empathy,^{33,34} rather than state empathy, and in hindsight this questionnaire might not have been the best measure to assess change. Moreover, since (empathy) questionnaires rely on self-report, one could argue that only the appraisal of empathy was measured; the caregivers' opinion about how they would feel or act in a certain situation, rather than the emotion or behavior itself. A means to overcome these questionnaire-related problems is to also include objective measures of empathy, to complement the IRI. This way, it would also be possible to assess if these measure the same

construct or not. No objective empathy measures were used in this study because filling out the questionnaires already was time consuming for the participants and we were trying to keep the time investment to a minimum. The original idea for the current study was to also develop a prediction model for change.¹⁸ However, due to the absence of change on the questionnaires on both group and individual level, this idea has been abandoned.

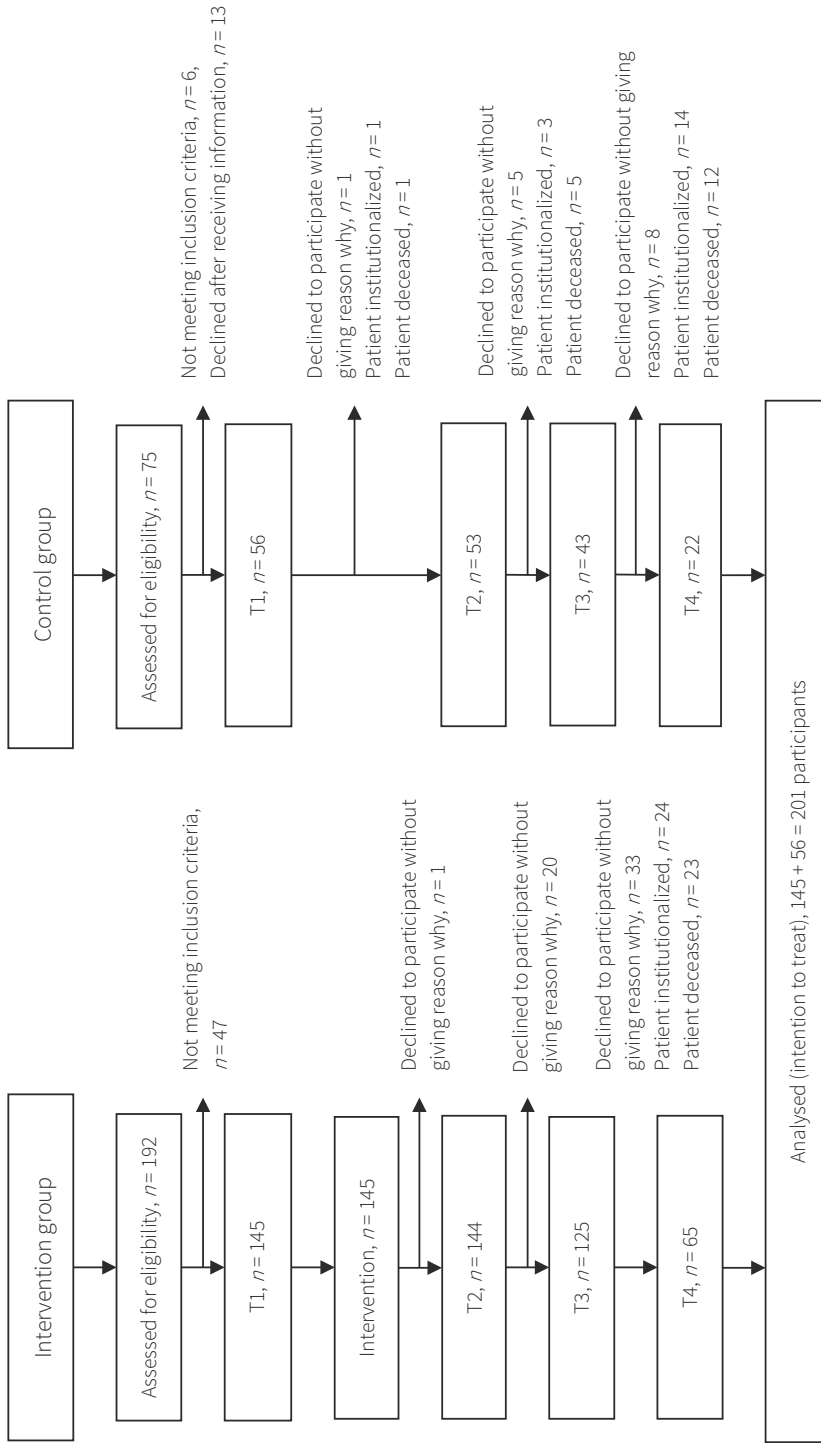
Despite these limitations, this study has direct relevance for both clinical practice and research. The intervention contributed to enhancing caregivers' understanding of (people with) dementia, and helped them to feel more effective in caring for their loved one. If the clinician's goal is to heighten understanding and improve the caregivers' experience, this intervention is useful. Future research can consider enriching this intervention with other aspects like educational material, more simulations, and group sessions, tailored to the individual caregiver and their situation, and examine if these new interventions also yield change on questionnaires. These new, more personalized interventions designed for dementia caregivers could go a long way in helping caregivers better understand the persons with dementia they care for. This could in turn not only assist the caregivers in their caregiving tasks but could also enhance their own well-being and that of the person with dementia they care for.

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**Supplementary Figure S1** Flowchart of the participants

Note. The participants who did not complete an assessment without giving reasons why, were invited to take part in the following measurement(s), so it is possible that a participant did not complete T2, but did complete T3. At each time point, the reference point in the chart was the number at T1.

Supplementary Table S1 Differences at baseline between participants lost to follow-up and those who completed T3

| | Experimental group | | | | Control group | | | |
|--|-------------------------|-----------------------------|-------------------------|---------|------------------------|-----------------------------|-------------------------|---------|
| | T3 completers (n = 125) | Drop-out before T3 (n = 20) | Test-value ^a | p-value | T3 completers (n = 43) | Drop-out before T3 (n = 13) | Test-value ^a | p-value |
| Characteristics informal caregivers | | | | | | | | |
| Age | 59.5 ± 11.8 | 60.3 ± 13.1 | -0.278 | .781 | 64.7 ± 10.8 | 60.9 ± 15.0 | 1.018 | .313 |
| Male sex | 20.3% | 22.7% | NA | .779 | 24.4% | 18.2% | NA | 1.00 |
| Level of education ^b | | | | | | | | |
| Low | 17.1% | 9.1% | 1.295 | .494 | 13.3% | 9.1% | 0.181 | 1.00 |
| Medium | 34.1% | 45.5% | | | 35.6% | 36.4% | | |
| High | 48.8% | 45.5% | | | 51.1% | 54.5% | | |
| Hours providing care a week | 46.8 ± 61.4 | 49.5 ± 53.2 | -0.188 | .851 | 78.1 ± 67.9 | 80.4 ± 58.8 | -0.112 | .911 |
| Relationship with the patient | | | | | | | | |
| Spouse | 33.6% | 50.0% | 2.030 | .392 | 56.6% | 45.5% | 1.081 | .693 |
| Child | 48.4% | 36.4% | | | 40.0% | 45.5% | | |
| Other | 18.0% | 13.6% | | | 4.4% | 9.1% | | |
| Co-residence with the patient (%yes) | 30.6% | 40.9% | 0.910 | .457 | 60.0% | 45.5% | NA | .501 |
| Characteristics persons with dementia | | | | | | | | |
| Age | 79.2 ± 8.1 | 76.4 ± 10.5 | 1.324 | .188 | 77.2 ± 7.6 | 81.0 ± 8.6 | -1.542 | .129 |
| Male sex | 43.0% | 40.9% | 0.032 | .857 | 47.7% | 45.5% | 0.018 | .893 |
| Dementia diagnosis | | | | | | | | |
| AD | 59.3% | 59.1% | 3.191 | .479 | 58.5% | 60.0% | 1.757 | .876 |
| VaD | 13.8% | 27.3% | | | 24.4% | 20.0% | | |
| PD | 2.4% | 0% | | | 2.4% | 0% | | |
| Other | 6.5% | 13.6% | | | 4.9% | 20.0% | | |
| NDD | 17.9% | 0% | | | 9.8% | 0% | | |
| Time since diagnosis in years | 3.4 ± 2.6 | 3.4 ± 2.6 | 0.014 | .988 | 2.6 ± 2.3 | 2.5 ± 2.0 | 0.262 | .795 |

Supplementary Table S1 Differences at baseline between participants lost to follow-up and those who completed T3 (continued)

| Baseline scores on the questionnaires | | | | | | | | | |
|--|------------|------------|--------|-------|------------|------------|--------|-------|--|
| IRI - Perspective Taking | 17.8 ± 3.9 | 17.2 ± 4.8 | 0.604 | .547 | 17.0 ± 4.2 | 18.5 ± 5.0 | -1.034 | .306 | |
| IRI - Empathic Concern | 17.6 ± 4.4 | 18.7 ± 4.2 | -1.034 | .303 | 17.5 ± 3.8 | 18.6 ± 4.2 | -0.896 | .374 | |
| HADS - Depression | 4.6 ± 4.0 | 6.2 ± 5.1 | -1.595 | .113 | 5.2 ± 3.4 | 6.6 ± 3.6 | -1.334 | .188 | |
| HADS - Anxiety | 5.8 ± 3.7 | 8.3 ± 3.8 | -2.940 | .004* | 7.2 ± 4.0 | 9.5 ± 5.0 | -1.595 | .117 | |
| CRA - Disruption | 2.8 ± 0.9 | 2.9 ± 1.1 | -0.425 | .671 | 3.4 ± 0.8 | 3.8 ± 0.8 | -1.775 | .082 | |
| CRA - Health | 2.3 ± 0.7 | 2.7 ± 1.0 | -1.456 | .158 | 2.8 ± 0.9 | 3.5 ± 0.8 | -2.174 | .034* | |
| CRA - Support | 2.3 ± 0.8 | 1.9 ± 0.9 | 2.131 | .035* | 2.7 ± 0.8 | 2.7 ± 0.7 | 0.110 | .913 | |
| CRA - Self-esteem | 3.8 ± 0.6 | 3.8 ± 0.5 | 0.119 | .906 | 3.7 ± 0.6 | 3.6 ± 0.7 | 0.787 | .435 | |
| CRA - Finances | 2.3 ± 0.6 | 2.5 ± 0.6 | -1.269 | .207 | 2.6 ± 0.8 | 2.5 ± 1.0 | 0.572 | .570 | |
| RQI | 31.6 ± 8.1 | 31.3 ± 7.2 | 0.158 | .875 | 29.5 ± 8.6 | 29.2 ± 9.4 | 0.128 | .899 | |
| QoR - current | 13.4 ± 2.6 | 12.2 ± 3.9 | 1.292 | .211 | 13.7 ± 2.9 | 12.5 ± 3.2 | 1.330 | .189 | |
| SSCO | 27.6 ± 4.8 | 25.4 ± 5.9 | 1.819 | .071 | 24.6 ± 5.5 | 22.7 ± 5.4 | 1.091 | .280 | |

Note. Values are presented as $M \pm SD$ or %. The number of participants differ per variable due to missing values.

AD, Alzheimer's dementia; CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; NDD, No Differential Diagnosis; PD, Dementia associated with Parkinson's Disease; QoR, Quality of Relationship; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire; VaD, Vascular Dementia.

*Test-values for continuous outcome were t -values, for categorical values; Pearson chi-square values. If cell count < 5, the p -value of the Fisher's exact test (2 categories) or Fisher-Freeman-Halton Exact Test (>2 categories) is presented. ^aEducational level according to Verhage,³⁶ recoded into low (1 - 4), medium (5), high (6 - 7).

* $p < .05$

Supplementary Table S2 Differences at baseline between participants lost to follow-up and those who completed T4

| | Experimental group | | | Control group | | |
|--|------------------------|-----------------------------|------------------------------------|------------------------|-----------------------------|------------------------------------|
| | T4 completers (n = 65) | Drop-out before T4 (n = 80) | Test-value ^a p-value | T4 completers (n = 22) | Drop-out before T4 (n = 34) | Test-value ^a p-value |
| Characteristics informal caregivers | | | | | | |
| Age | 58.5 ± 12.7 | 60.5 ± 11.3 | -0.967 | 63.6 ± 10.5 | 64.0 ± 12.8 | -0.144 |
| Male sex | 23.4% | 18.5% | NA | 13.6% | 29.4% | NA |
| Level of education ^b | 8.0% | 22.2% | 5.741 | 18.2% | 8.9% | 0.168 |
| Low | 37.5% | 34.6% | | 45.5% | 29.4% | |
| Medium | 54.5% | 43.2% | | 36.3% | 61.7% | |
| High | 45.3 ± 59.5 | 48.7 ± 60.9 | -0.332 | 80.3 ± 65.5 | 77.5 ± 66.3 | -0.158 |
| Hours providing care a week | 37.5% | 35.0% | 0.381 | 59.2% | 50.0% | 1.904 |
| Relationship with the patient | 43.8% | 48.8% | | 31.8% | 47.0% | |
| Child | 18.7% | 16.2% | | 9% | 3% | |
| Other | 33.3% | 31.3% | 0.070 | 63.6% | 52.9% | 0.624 |
| Co-residence with the patient (%yes) | | | | | | |
| Characteristics persons with dementia | | | | | | |
| Age | 79.0 ± 8.3 | 78.7 ± 8.6 | 0.168 | 75.8 ± 7.5 | 79.7 ± 8.0 | -1.823 |
| Male sex | 42.2% | 43.0% | 0.010 | 59.1% | 39.4% | 2.055 |
| Dementia diagnosis | 60.9% | 58.0% | 4.212 | 55.0% | 61.3% | 1.847 |
| AD | 18.8% | 13.6% | | 25.0% | 22.6% | |
| VaD | 0.0% | 3.7% | | 5.0% | 0.0% | |
| PD | 3.1% | 7.4% | | 5.0% | 3.2% | |
| Other | 17.2% | 17.3% | | 10.0% | 12.9% | |
| NDD | 3.4 ± 2.8 | 3.4 ± 2.4 | 0.121 | 3.1 ± 2.9 | 2.3 ± 1.7 | 1.315 |
| Time since diagnosis in years | | | .904 | | | .194 |

Supplementary Table S2 Differences at baseline between participants lost to follow-up and those who completed T4 (continued)

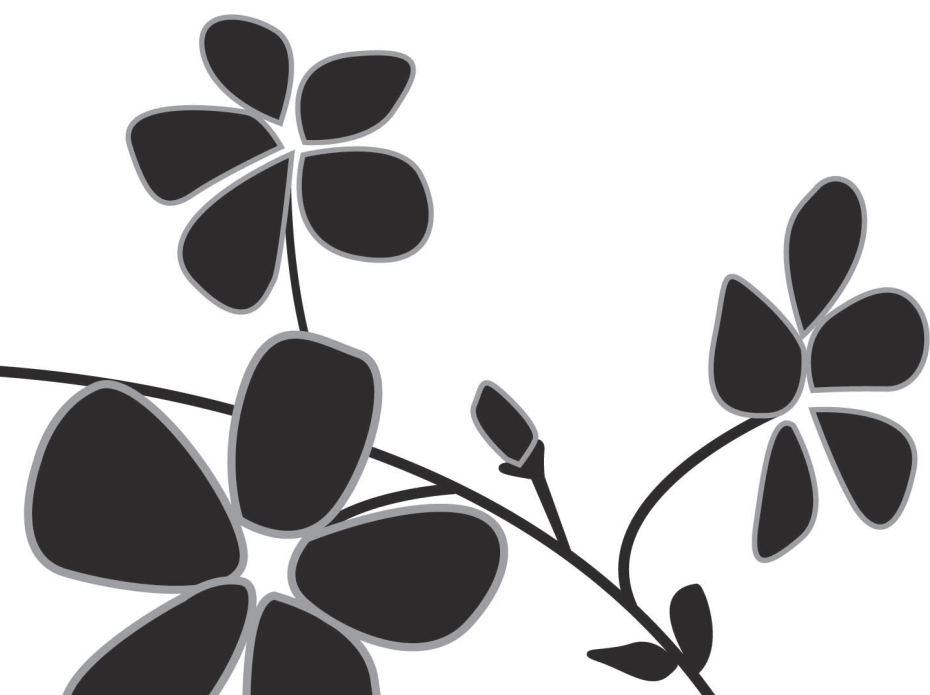
| Baseline scores on the questionnaires | | | | | | | | |
|--|------------|------------|--------|------|------------|------------|---------|-------|
| IRI - Perspective Taking | 17.8 ± 4.0 | 17.5 ± 4.0 | 0.560 | .576 | 17.6 ± 5.3 | 17.2 ± 3.9 | 0.350 | .728 |
| IRI - Empathic Concern | 17.5 ± 4.6 | 18.0 ± 4.2 | -0.627 | .532 | 17.7 ± 3.7 | 17.8 ± 4.0 | -0.167 | .868 |
| HADS - Depression | 5.0 ± 4.2 | 4.8 ± 4.3 | 0.278 | .783 | 4.8 ± 3.4 | 5.9 ± 3.5 | -1.189 | .240 |
| HADS - Anxiety | 6.4 ± 3.9 | 6.0 ± 3.8 | 0.693 | .489 | 7.7 ± 4.3 | 7.9 ± 4.3 | -0.194 | .847 |
| CRA - Disruption | 2.9 ± 0.9 | 2.9 ± 0.9 | 0.313 | .755 | 3.5 ± 0.7 | 3.4 ± 0.9 | 0.373 | .711 |
| CRA - Health | 2.4 ± 0.8 | 2.4 ± 0.8 | -0.198 | .843 | 2.8 ± 1.0 | 3.1 ± 0.9 | -1.1919 | .239 |
| CRA - Support | 2.3 ± 0.9 | 2.3 ± 0.7 | 0.004 | .997 | 2.9 ± 0.8 | 2.6 ± 0.8 | 1.407 | .165 |
| CRA - Self-esteem | 3.8 ± 0.6 | 3.8 ± 0.6 | 0.921 | .359 | 3.8 ± 0.5 | 3.6 ± 0.7 | 0.991 | .326 |
| CRA - Finances | 2.3 ± 0.7 | 2.3 ± 0.6 | -0.340 | .734 | 2.9 ± 0.7 | 2.4 ± 0.9 | 2.114 | .039* |
| RQI | 31.9 ± 8.4 | 31.3 ± 7.6 | 0.380 | .705 | 28.8 ± 9.2 | 29.8 ± 8.5 | -0.4212 | .682 |
| QoR - current | 13.4 ± 2.7 | 13.1 ± 3.0 | 0.622 | .535 | 13.4 ± 3.3 | 13.4 ± 2.9 | -0.004 | .997 |
| SSCQ | 27.5 ± 5.0 | 27.1 ± 5.0 | 0.507 | .613 | 23.7 ± 6.5 | 24.4 ± 4.8 | -0.503 | .617 |

Note. Values are presented as $M \pm SD$ or %. The number of participants differ per variable due to missing values.

AD, Alzheimer's dementia; CRA, Caregiver Reaction Assessment; HADS, Hospital Anxiety and Depression Scale; IRI, Interpersonal Reactivity Index; NDD, No Differential Diagnosis; PD, Dementia associated with Parkinson's Disease; QoR, Quality of Relationship; RQI, Relationship Quality Index; SSCQ, Short Sense of Competence Questionnaire; VaD, Vascular Dementia.

^aTest-values for continuous outcome were t-values, for categorical values; Pearson chi-square values. If cell count < 5, the p-value of the Fisher's exact test (2 categories) or Fisher-Freeman-Halton Exact Test (>2 categories) is presented. ^bEducational level according to Verhage,³⁵ recoded into low (1 - 4), medium (5), high (6 - 7).

* $p < .05$



CHAPTER 7

THE EFFECTIVENESS OF PSYCHOSOCIAL AND BEHAVIORAL
INTERVENTIONS FOR INFORMAL DEMENTIA CAREGIVERS:
META-ANALYSES AND META-REGRESSIONS

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ABSTRACT

Background: Many psychosocial and behavioral interventions have been developed for informal dementia caregivers. Because existing meta-analyses only focused on a limited number of interventions and outcomes, how effective these interventions are overall and which intervention components are associated with larger effects has yet to be explored.

Objectives: To provide a comprehensive meta-analysis of the effectiveness of psychosocial and behavioral interventions on burden, depression, anxiety, quality of life, stress, and sense of competence in informal dementia caregivers. In addition, we examined if interventions which utilized more sessions and/or were delivered personally (face-to-face) had larger effect sizes. In exploratory meta-regressions, we examined seven additional moderators.

Methods: The protocol was registered with PROSPERO, number CRD42017062555. We systematically searched the literature to identify controlled trials assessing the effect of psychosocial and behavioral interventions on the six outcome measures, for informal dementia caregivers. We performed six random effects meta-analyses, to assess the pooled effect sizes of the interventions. In addition, we performed separate meta-regressions, for each outcome, for each moderator.

Results: The sample consisted of 60 studies. For all outcomes except anxiety, the pooled effects were small and in favor of the intervention group. No moderator was found to systematically predict these effects. There were no indications for publication bias or selection bias based on significance.

Conclusion: Overall, the interventions yield significant (small) effects, independent of intervention characteristics. Future research should explore options to enhance the effectiveness of interventions aimed at assisting informal caregivers.

INTRODUCTION

Worldwide, more than 47 million people suffer from dementia, with 9.9 million new cases diagnosed every year, predominantly in Asia, Europe, and America.¹ Most patients are community-residing and cared for by at least one informal caregiver (hereafter caregiver), typically an unpaid spouse, relative, or friend of the person with dementia.²

Although caregiving is satisfying for some caregivers,³⁻⁶ it can also be very burdensome,^{7,8} with depression⁹ and caregiver burden¹⁰ being the most prevalent problems. Caregivers also often experience relatively high rates of anxiety, and general distress,¹¹ and their quality of life and sense of competence can be negatively affected by their caregiving responsibilities.^{12,13}

Many psychosocial or behavioral interventions to support these caregivers have been developed. These include training and education programs, support groups, counseling, and so-called ‘multi-component interventions’ that combine two or more of the previous types (e.g. education and support). Existing meta-analyses in this area mostly limited their focus to specific subgroups of informal caregivers, e.g. only co-residing caregivers;¹⁴ or to one specific ‘type’ of intervention, such as meditative interventions,¹⁵ service-coordinating interventions,¹⁶ or educational interventions.¹⁷ While classifying interventions may seem useful, substantial inconsistencies exist in how they have been categorized across systematic reviews,¹⁸ which in turn hinders interpretation of the findings and comparability of the results. In addition, due to focusing on only one of these categories or on one specific subgroup, the overall and relative effectiveness of the interventions remain unclear. Meta-analyses which have examined all psychosocial interventions for caregivers of people with dementia, are no longer up to date.¹⁹

Some previous meta-analyses tried to identify intervention characteristics which contributed to larger effects; Backhouse et al.¹⁶ found, among four service coordinating interventions, that those delivered by case managers with a nursing background showed greater positive effects on caregiver quality of life compared to those that were delivered by professionals with other backgrounds (standardized mean difference (*SMD*) = 0.94 versus *SMD* = 0.03 respectively). However, this characteristic was not associated with larger effects on the other outcomes (burden, mood, outcomes related to the person with dementia). Jensen et al.¹⁷ also employed subgroup analyses (with $k = 5$ educational intervention studies) and found that shorter interventions yielded larger effects on caregiver burden than longer interventions. However, the authors noticed that the same analysis also separated trials into settings in low versus high income countries with greater effects seen in low income countries. Brodaty et al.¹⁹ examined five predictors: whether the intervention involved support/help from extended family, counseling, involvement of both the caregiver and the person with dementia, support groups, and stress management. They only found that involvement of both the person with dementia and the caregiver in the intervention was associated with

larger effect sizes on caregiver psychological morbidity. No significant effects were found for the other characteristics evaluated. Overall, the results have been mixed, probably due to the inclusion of small subsets of studies, and because the focus has typically been on one specific intervention type. Thus, the overall and relative effectiveness of these interventions and the intervention characteristics that predict greater effects remain unclear. The current study aims to answer these questions.

Schulz et al.²⁰ developed an intervention taxonomy in an attempt to systematically describe features of psychosocial and behavioral interventions. This taxonomy focused on two broad categories: delivery characteristics and intervention content. In addition, the taxonomy considered adaptability, that is, whether or not the intervention is (or can be) tailored to the participant. Gaugler et al.¹⁸ examined the differences in the labeling of informal dementia caregiver interventions across various systematic reviews. They found substantial inconsistencies and discovered, using a qualitative content analysis, seven themes by which dementia caregiver interventions were categorized. These themes overlapped with the intervention taxonomy by Schulz et al.²⁰ and included: content or type (e.g. education, psychosocial support, skill-building), delivery modality, intended audience (e.g. dyadic, individual), whether or not the intervention was standardized or tailored to the participant, the number of sessions, and the source of delivery (professional or peer-led). Both Schulz et al.²⁰ and Gaugler et al.¹⁸ argued that accurate reporting of intervention components, and using these in a meta-analysis, would lead to a better determination as to which characteristics contribute to larger effects. This knowledge could in turn be used to develop the most effective interventions for both informal dementia caregivers and the people with dementia they care for. However, no meta-analysis to date has attempted to analyze all types of psychosocial and behavioral interventions, irrespective of certain types, and tried to identify which of these intervention characteristics contribute to larger effects.

To fill this gap, we aimed to evaluate the effectiveness of interventions for informal dementia caregivers in reducing caregiver burden, depression, anxiety, and general (dis)stress, and in heightening quality of life, and sense of competence. Caregiver burden and depression were the primary outcome measures in our meta-analyses, while the other variables were secondary outcomes. We hypothesized that the interventions would show small to moderate average effect sizes, with a considerable amount of heterogeneity due to differences in the intervention characteristics, and heterogeneity across the included participants. Meta-regressions were carried out in order to identify which intervention characteristics, as proposed by Schulz et al.²⁰ and Gaugler et al.¹⁸, were associated with larger intervention effects. We hypothesized that interventions which utilized more sessions and/or those which were delivered personally (face-to-face) instead of indirectly (via the internet or telephone), would show larger effects.

METHOD

This review is registered with PROSPERO (number CRD42017062555).

Search strategy

The following databases were systematically searched: MEDLINE in PubMed, Psycarticles; Psychology and Behavioral Sciences Collection; and PsycINFO via EBSCO Host, the Cochrane Library, and EMBASE. The search was conducted using the following keywords: Caregivers [MeSH]/Caregiver/Care givers/Care giver/Carers/Carer, Informal/Family, Dementia [MeSH]/Alzheimer/Alzheimers, Intervention/Training/Support. Terms were searched in titles and abstracts. The customized strategies for each database can be found in Supplementary Table S1. The reference lists of the selected studies and published reviews were manually scanned for supplementary relevant publications.

Eligibility criteria

For studies to be included in this review, they had to meet the following inclusion criteria:

Participants. A sample ($n > 5$) of adults (≥ 18 years) providing informal care to a relative, spouse, or friend with dementia. If a combined sample (of for instance professional and informal caregivers) was used, the study was only considered when data for informal caregivers were reported separately.

Intervention. Non-pharmacological, psychosocial, psycho-behavioral, or psychoeducational interventions for informal caregivers were included. Dyadic interventions were excluded, because these studies include both the caregiver and the person with dementia, and partly depend on participation of the people with dementia. This can bias inclusion because then only the caregivers who care for the more active or willing persons with dementia are included. In addition, respite interventions, case management/nursing interventions (which are generally considered usual care), cost-effectiveness studies, usability studies, protocols, and drug trials (for either caregivers or people with dementia) were also excluded.

Intervention and control group. The design included both an intervention and an untreated control condition. Comparisons of several treatments (without an untreated control group) were not included because (i) the goal of this meta-analysis was to test whether greater improvements were found in caregivers who received treatment compared with caregivers who received no specific intervention(s); (ii) if interventions were compared, there would be no theoretical reason to label one as the experimental group and the other as the control condition; and (iii) comparing the change of an experimental condition to the change of a

control condition who also received help, underestimates intervention effects when both interventions show desired effects. Single group pre-posttest studies were excluded because of this design's inherent weakness in reaching valid conclusions. These studies often do not permit reasonable causal inferences, because observed changes can be due to other aspects than the intervention, including regression to the mean, maturation, and test effects.^{21,22} This weakness justifies their omission from meta-analyses.²³

Outcomes. At least one outcome measure experienced by the caregiver was included as an effectivity measure, which could be clustered into one of the following domains: burden, depression, anxiety, (di)stress, quality of life, or sense of competence.

Other. The publication was an original empirical article published in English between 01-01-2002 and 01-27-2017. Protocols, implementation studies, letters to the editor, and comments were excluded. Reviews were excluded, but their references were hand searched for additional articles. When studies reported identical results using the same participant sample with the same intervention, we only used the most recent publication. When studies evaluated the same intervention, but with different samples, we included both (independent) studies. Experimental and quasi-experimental studies were both included in order to analyze all possible data ensuring that no valuable insights were lost by including only experimental studies. We only included quantitative (not qualitative) studies.

Study selection

Two reviewers (LJ and RM) independently screened the titles and abstracts of studies retrieved using the search strategy in order to identify studies that met our inclusion criteria. If they met the criteria, full-texts were obtained and again independently assessed (by the same two reviewers) for eligibility. Disagreements were resolved by consensus. If consensus could not be reached, a third reviewer was consulted.

Data collection process

Data regarding study design, participants and intervention characteristics, outcome measures (data from the first follow-up assessment after completion of the intervention) and moderators were extracted by one reviewer (LJ) using a self-developed, pre-piloted, data extraction form. If studies reported statistics for subscales of questionnaires which measured the same construct (for example, if multiple subscales of one questionnaire measured burden), the accompanying effect sizes were pooled.²⁴ If studies used multiple questionnaires measuring one outcome measure (e.g. both CES-D and HADS-D were used to measure depression), only the first described questionnaire was included in the analyses.

If studies reported two or more interventions (and an untreated control condition), only the most complete was used. In case of equal relevance, we only used the first intervention.

The reviewer extracting the data completed three rounds: one initial assessment and two additional checks for inconsistencies/errors. In case of difficulties, the second and/or third reviewer was asked for his/her judgment. All problems were resolved through discussion. In case of incomplete data (so *SMD*'s could not be calculated), we contacted the original authors. The authors were given three weeks to reply, after which two follow-up e-mails were sent. If there was still no reply, we used published data. In the case of no published data, the study was omitted. Adjusted data from Bourgeois et al.,²⁵ Joling et al.,²⁶ Gonzalez et al.,²⁷ and Hepburn et al.²⁸ were used because unadjusted data were unavailable upon request.

Statistical analyses and data synthesis

The results of studies measuring the same outcome variables (burden, depression, anxiety, (di)stress, quality of life, sense of competence), were pooled using random-effects meta-analyses based on standardized mean differences (Hedges' *g*). Burden and depression were the primary outcome measures while the others were secondary outcome measures. Effect sizes were recalculated so that higher scores indicated more burden, more depression symptoms, more anxiety symptoms, more stress, higher quality of life, and greater sense of competence. 95% Confidence Intervals were used and two-sided *p*-values were employed for each outcome variable. Six separate meta-analyses were conducted in total (one for each outcome variable). Heterogeneity between the studies in effect sizes was assessed using both the *Q*-test and the *I*² statistic. An *I*² value greater than 50% was considered indicative of substantial heterogeneity. To check for publication bias, Sterne and Egger's test²⁹ for funnel plot asymmetry was used (with alpha set at .10), followed up by another sensitivity test using *p*-uniform for sufficiently homogenous subsets of studies.^{30,31}

To identify which intervention characteristics were associated with greater effects on each of the six outcome measures, we ran six mixed effects meta-regressions. The following moderators were tested in a confirmatory manner: the type of delivery (dummy coded, face-to-face/other), and the number of sessions (continuous) (against alpha = .05 based on the *Q*-test for that moderator). Both the individual contribution of the moderators and their interaction were tested in separate regression analyses. In addition, the following moderators were added in explorative analyses: intervention type (categorical variable: psychoeducational, support, psychotherapy), content (the inclusion of knowledge transfer, skill training, support, feedback, and/or cognitive counseling (all dummy coded, included/not included)), materials used (written information, assistive devices, and/or homework (all dummy coded, included/not included)), whether or not the interventions were adaptable/tailored to the participant (dummy coded, yes/no), whether or not it was a group intervention

(dummy coded, yes/no), and the location where the intervention took place (dummy coded, at home/other). Ideally, for each outcome six exploratory meta-regressions were executed; one for each moderator. However, a meta-regression was only executed if there were >10 studies included in the meta-analysis to ensure statistical power.

All analyses were executed using the R package Metafor (version 2.0)³² using Restricted Maximum Likelihood (REML).

RESULTS

The literature searches identified 5133 potentially relevant studies, and 9 were added by manually scanning reference lists (of existing reviews). After removing the duplicates, 3782 studies remained, of which 3416 were discarded after reading the title/abstract. 366 full texts were retrieved, of which 297 were excluded for a variety of reasons; 23 studies did not evaluate a psychosocial or behavioral intervention; 44 studies did not include one of the pre-specified outcomes; 59 studies did not have at least 1 intervention and 1 control group; 44 studies included no(t) (only) informal caregivers; 104 studies were not original empirical effectivity studies, but protocols or implementation studies; 9 were in another language than English; and 14 studies used only qualitative analyses. 7 papers could not be included because we did not receive the required data on request, and 1 paper was excluded due to the reporting of incoherent data. The final, included, sample consisted of 60 studies, published between 2002 and 2017. Figure 1 shows the PRISMA³³ flow diagram and Table 1 (placed after the references) shows an overview of the included studies.

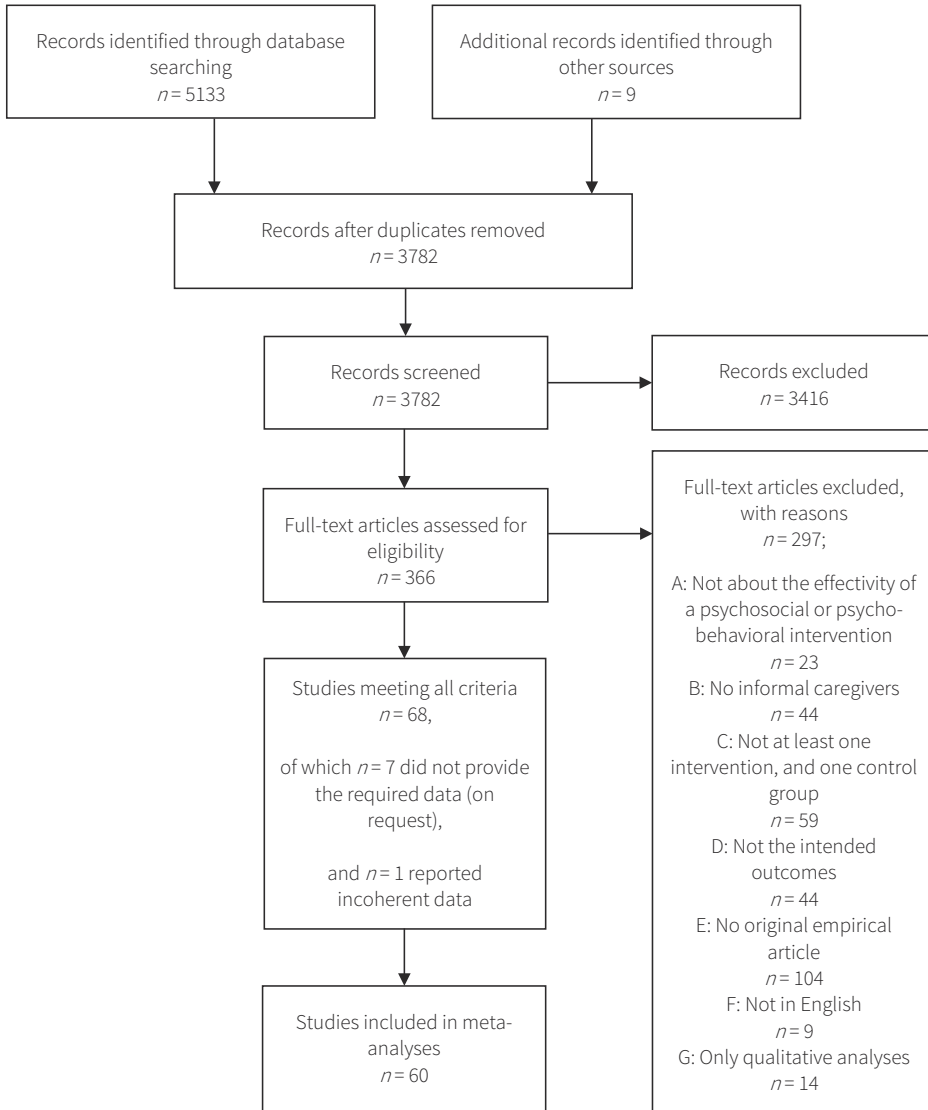


Figure 1 Flow Diagram

Meta-analyses

Primary outcome variables

Figures 2 and 3 show the forest plots containing all the effect sizes for each study and the pooled effect sizes for the outcome variables burden and depression respectively.

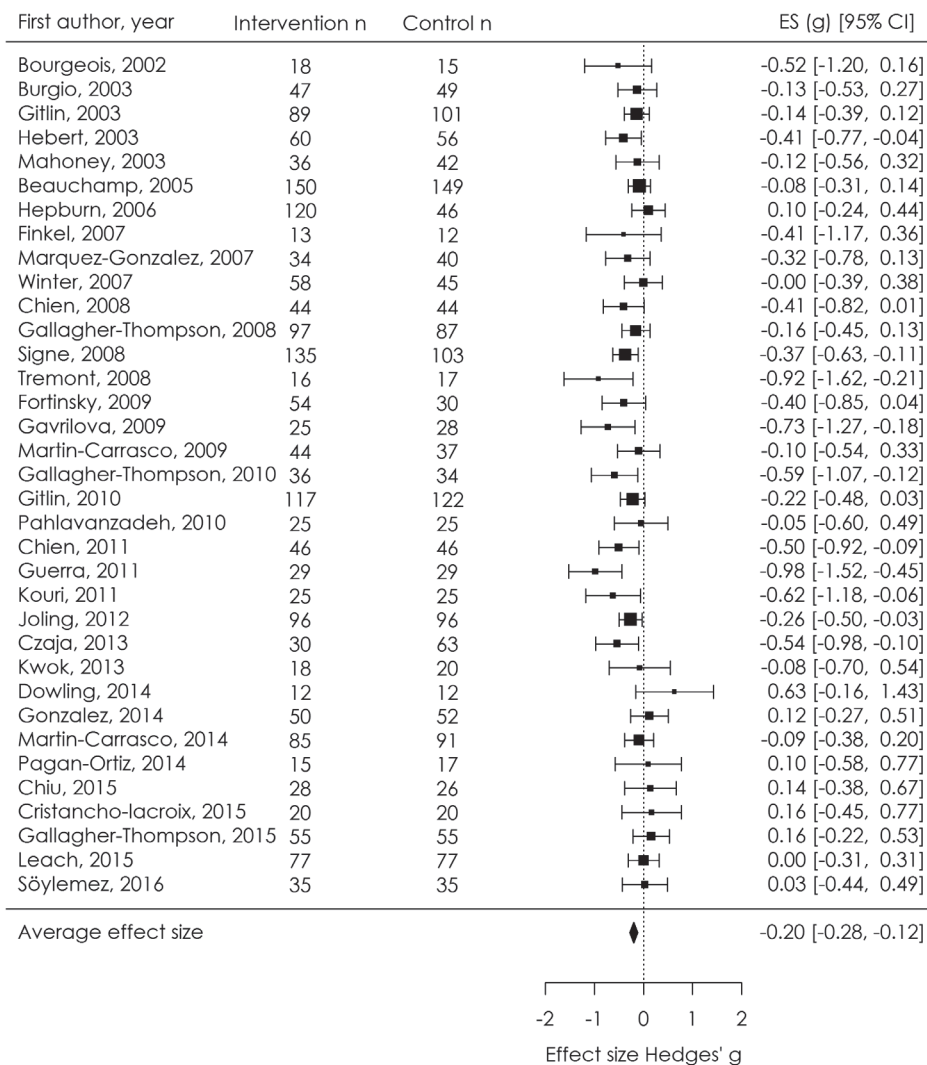


Figure 2 Intervention effects on caregiver burden

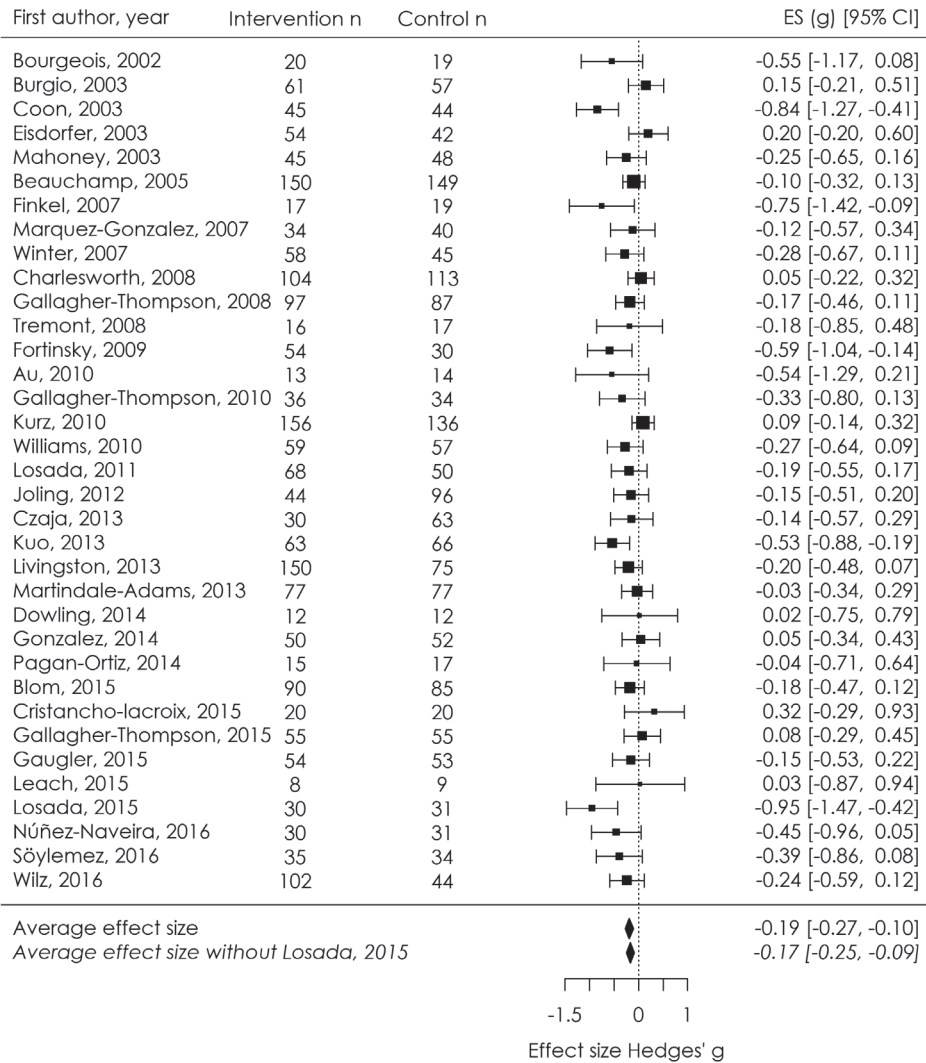


Figure 3 Intervention effects on depression

Caregiver burden. The random-effects analysis ($k = 35$, total $n = 3682$) on the intervention effects on caregiver burden, yielded an estimated average effect of $g = -0.20$, $p < .001$, 95% CI [-0.28, -0.12]. This is a small effect size and indicates that the participants who were exposed to an intervention, scored lower on burden questionnaires than the control group, after the intervention. There was a significant amount of heterogeneity, $Q(34) = 54.49$, $p = .014$, $I^2 =$

28.62%, estimated at $\tau^2 = 0.02$, $SE = 0.01$, which indicates that there is variability among the underlying population of effect sizes. Sensitivity tests identified no outliers.

Depression. The random effects analysis on depression ($k = 35$, total $n = 3773$) yielded an estimated average (small) effect of $g = -0.19$, $p < .001$, 95% CI [-0.27, -0.10], in favor of the intervention group. There was a significant amount of heterogeneity, $Q(34) = 55.19$, $p = .012$, $I^2 = 37.54\%$, estimated at $\tau^2 = 0.02$, $SE = 0.02$.

Sensitivity tests (Q -test and the I^2 statistic) identified one outlier (Losada et al.³⁴), with an effect size of $g = -0.95$. One of the differences between this study and the other studies is that Losada et al.³⁴ only included participants with high depressive symptomatology at baseline, whereas other studies included all participants, regardless of their baseline depressive symptoms. As such, the participants in the study by Losada et al.³⁴ may have had more room for growth and are more likely to show change after an intervention. Removing this outlier reduced the residual heterogeneity, $Q(33) = 46.48$, $p = .060$, $I^2 = 28.43\%$, estimated at $\tau^2 = 0.02$, $SE = 0.01$. This analysis yielded an estimated average (small) effect of $g = -0.17$, 95% CI [-0.25, -0.09], $p < .001$.

Secondary outcome variables

Figures 4, 5, 6, and 7 show the forest plots for the outcome variables anxiety, quality of life, stress, and sense of competence respectively.

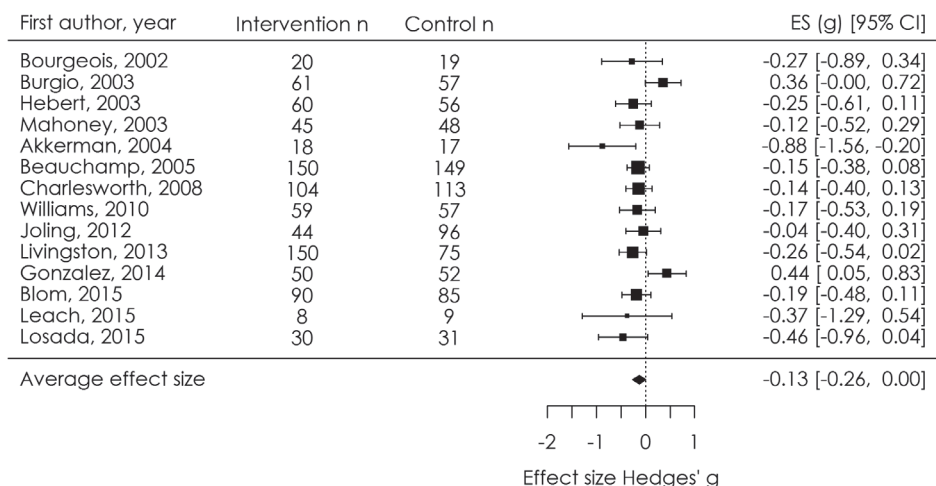


Figure 4 Intervention effects on anxiety

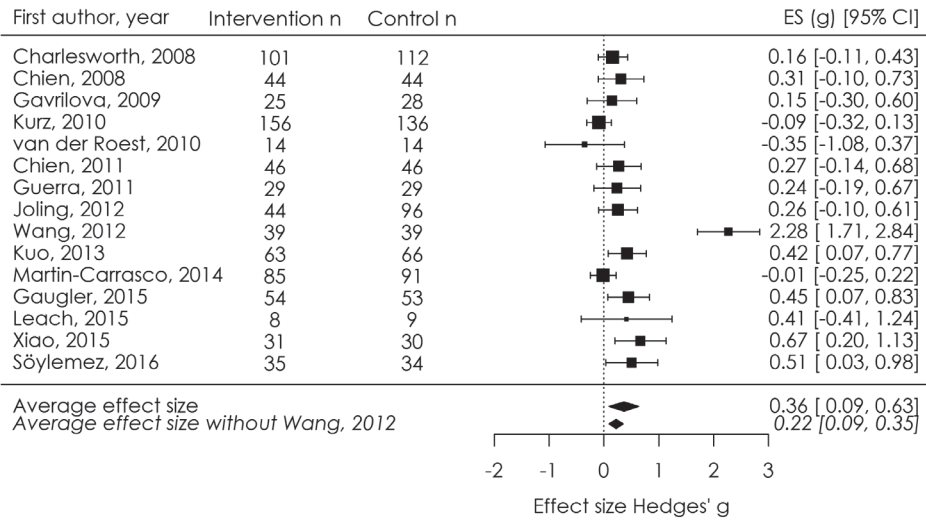


Figure 5 Intervention effects on quality of life

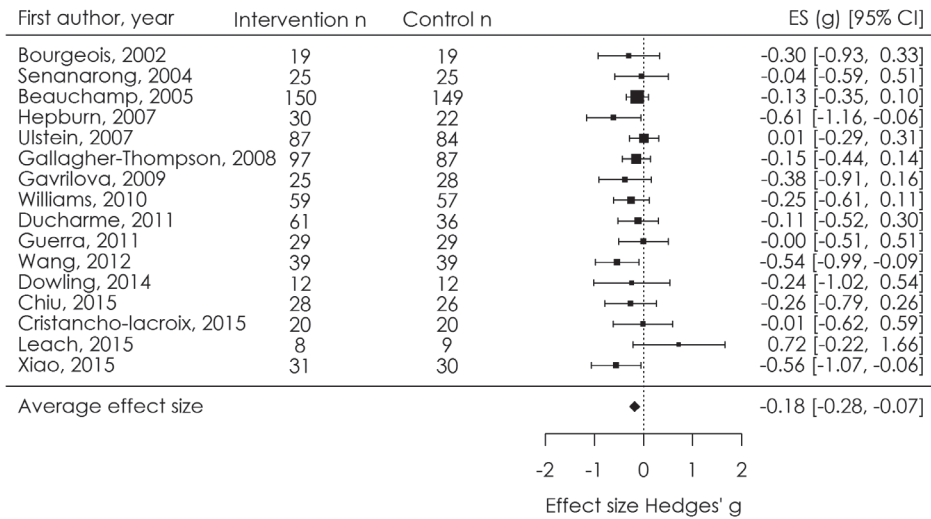


Figure 6 Intervention effects on stress

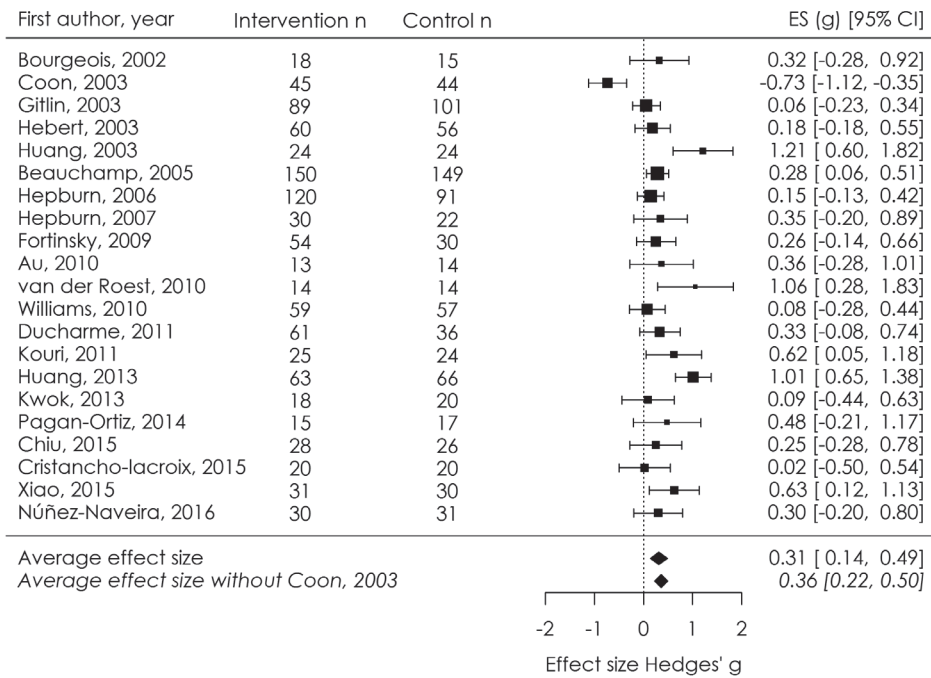


Figure 7 Intervention effects on sense of competence

Anxiety. The random-effects analysis on the outcome anxiety ($k = 14$, total $n = 1753$), yielded an estimated non-significant (small) effect of $g = -0.13$, $p = .058$, 95% CI [-0.26, 0.00]. There was a significant amount of heterogeneity, $Q(13) = 23.65$, $p = .035$, $I^2 = 43.35\%$, estimated at $\tau^2 = 0.03$, $SE = 0.02$. Sensitivity tests identified no significant outliers.

Quality of life. Regarding the outcome quality of life ($k = 15$, total $n = 1601$), the analysis yielded an estimated significant (small to medium) effect of $g = 0.36$, $p = .008$, 95% CI [0.09, 0.63], in favor of the intervention group. There was a significant amount of heterogeneity, $Q(14) = 71.90$, $p < .001$, $I^2 = 86.50\%$, estimated at $\tau^2 = 0.23$, $SE = 0.11$.

Sensitivity tests (Q -test and the I^2 statistic) identified one outlier (Wang³⁵), with an effect size of $g = 2.27$. The model without this outlier reduced the amount of heterogeneity, $Q(13) = 21.11$, $p = .071$, $I^2 = 39.35\%$, estimated at $\tau^2 = 0.02$, $SE = 0.02$. The effect size for this model was small; $g = 0.22$, $p = .001$, 95% CI [0.09, 0.35].

Stress. The random-effects analysis on stress ($k = 16$, total $n = 1392$), yielded an estimated average effect of $g = -0.18$, $p < .001$, 95% CI [-0.28, -0.07], favoring the intervention group. There

was no significant amount of heterogeneity, $Q(15) = 14.40$, $p = .495$, $I^2 = 0.00\%$, estimated at $\tau^2 = 0.00$, $SE = 0.01$). Sensitivity tests identified no outliers.

Sense of competence. The random-effects analysis ($k = 21$, total $n = 1854$) on the intervention effects on sense of competence yielded an estimated average effect of $g = 0.31$, $p < .001$, 95% CI [0.14, 0.49], in favor of the intervention group. There was a significant amount of heterogeneity, $Q(20) = 64.84$, $p < .001$, $I^2 = 71.04\%$, estimated at $\tau^2 = 0.11$, $SE = 0.05$.

Sensitivity tests (Q -test and the I^2 statistic) identified one outlier (Coon³⁶), with an effect size of $g = -0.73$. This deviating effect size was likely to due to pre-intervention differences between the intervention and control group on this outcome. The model without this outlier still yielded a significant amount of heterogeneity, $Q(19) = 37.74$, $p = .006$, $I^2 = 50.85\%$, estimated at $\tau^2 = 0.05$, $SE = 0.03$. The effect size for this model was small to medium, $g = 0.36$, $p < .001$, 95% CI [0.21, 0.50].

Meta-regressions

Primary predictors

Table 2 shows the meta-regressions for the primary predictor variables (delivery modality and number of sessions), per predictor, per outcome. The only meta-regression yielding a significant result was the regression on the outcome sense of competence, with the (positive) predictor number of sessions; $Q_M = 4.40$, $p = .036$.

Table 2 Results of the mixed-effects meta-regression analyses per moderator, per outcome

| Outcome | Predictor | k | Intercept | Slope coefficient | SE | p-value | 95% CI | Q _M | Q _E | τ ² | I ² | R ² |
|----------------------|---------------------------------------|----|-----------|-------------------|------|---------|-------------|----------------|----------------|----------------|----------------|----------------|
| Burden | Delivery modality (face-to-face) | 35 | -0.14 | -0.08 | 0.08 | .319 | -0.26;0.08 | 0.99 | 52.62* | 0.01 | 25.90% | 11.54% |
| | No. sessions | 30 | -0.11 | -0.01 | 0.01 | .300 | -0.03;0.01 | 1.07 | 45.12* | 0.02 | 28.59% | 0.00% |
| | Both moderators and their interaction | 30 | -0.01 | | | | | 1.92 | 43.63* | 0.02 | 31.48% | 0.00% |
| Depression | Delivery modality (face-to-face) | 34 | -0.17 | -0.07 | 0.32 | .817 | -0.70;0.55 | 0.01 | 46.39 | 0.02 | 30.62% | 0.00% |
| | No. sessions | 27 | -0.30 | -0.01 | 0.02 | .568 | -0.06;0.03 | 2.38 | 36.02 | 0.01 | 26.75% | 33.54% |
| | Both moderators and their interaction | 27 | -0.12 | 0.01 | 0.01 | .122 | -0.04;0.03 | 3.23 | 34.59 | 0.02 | 30.85% | 18.02% |
| Anxiety ^a | Delivery modality (face-to-face) | 14 | -0.16 | -0.23 | 0.26 | 0.366 | -0.74;0.27 | 0.07 | 23.34* | 0.03 | 48.40% | 0.00% |
| | No. sessions | 10 | -0.07 | <0.01 | 0.02 | .834 | -0.05;0.03 | 0.08 | 22.96** | 0.08 | 68.37% | 0.00% |
| | Both moderators and their interaction | 14 | -0.07 | 0.02 | 0.02 | .295 | -0.02;0.07 | 2.09 | 19.02 | 0.02 | 40.77% | 0.00% |
| QoL ^a | Delivery modality (face-to-face) | 14 | -0.35 | 0.59 | 0.40 | .380 | -0.21;1.38 | 0.79 | 17.55 | 0.02 | 40.51% | 0.00% |
| | No. sessions | 13 | 0.33 | -0.01 | 0.01 | .374 | -0.03;0.02 | 0.17 | 14.23 | 0.00 | 0.00% | 45.14% |
| | Both moderators and their interaction | 16 | -0.15 | -0.05 | 0.11 | .677 | -0.27;0.18 | 0.05 | 13.81 | 0.01 | 11.35% | 0.00% |
| Stress ^a | Delivery modality (face-to-face) | 13 | -0.15 | -0.01 | 0.02 | .824 | -0.05;0.04 | 0.83 | 36.54** | 0.05 | 50.38% | 0.00% |
| | No. sessions | 20 | 0.27 | 0.14 | 0.15 | .362 | -0.16;0.44 | 4.40* | 25.16* | 0.05 | 47.93% | 27.95% |
| | Both moderators and their interaction | 15 | 0.69 | -0.04 | 0.02 | .036* | -0.08;-0.03 | 4.49 | 24.73* | 0.06 | 54.12% | 13.51% |
| SoC | Delivery modality (face-to-face) | 15 | 0.69 | -0.01 | 0.67 | .999 | -1.32;1.32 | | | | | |
| | No. sessions | 15 | 0.69 | -0.05 | 0.06 | .393 | -0.17;0.07 | | | | | |
| | Both moderators and their interaction | 15 | 0.69 | 0.02 | 0.07 | 0.816 | -0.11;0.14 | | | | | |

Note. First, the predictors were examined in separate meta-regressions. To explore their interaction, the analyses were repeated including both moderators and the accompanying interaction. For the outcome variables depression, QoL, and SoC, the significant outliers were excluded from the meta-regressions. The moderator Delivery modality was dummy coded; face-to-face = 1, other = 0.

No. sessions, the number of sessions the intervention utilized (continuous variable); SoC, sense of competence; QoL, quality of life.

^aFor Anxiety, QoL, and Stress, the predictors could not be added simultaneously, because there was no variation in delivery modality in the remaining studies.

* $p < .05$, ** $p < .01$.

Exploratory predictors

Given the amount of heterogeneity, we conducted several additional exploratory meta-regressions. The predictors were: intervention type, the content of the intervention, the materials used, adaptability to the participant, intervention duration, whether it was a group or an individual intervention, and the location (participants' home or other). No predictors were found to systematically predict the outcomes, see Supplementary Table S2 through S7.

Publication bias

To check for publication bias, we ran a random effects version of Sterne and Egger's test²⁹ for funnel plot asymmetry (at $\alpha = .10$), for each outcome separately, and again for the models without outliers. The funnel plots can be found in the supplemental material (Supplementary Figure S1 A - F). For the models including the outliers, significant funnel plot asymmetry was found for the outcomes depression ($Z = -2.06, p = .039$), and SoC ($Z = 1.85, p = .065$). For the models without outliers, significant funnel plot asymmetry was found for the same two outcomes; depression ($Z = -1.80, p = .070$) and SoC ($Z = 1.88, p = .060$). These findings indicate that for these models, imprecise study samples (study samples with a larger standard error) averaged larger intervention effects than precise study samples. Although this disparity can be due to publication bias, there might be other (non-bias related) explanations for it.²⁹ We also used p-uniform to check for publication bias. No evidence for publication bias was found for either outcome variable. This aligns with the finding that the majority of the primary studies yielded non-significant outcomes. Altogether, we conclude that there are no indications for publication bias or selection bias based on significance.

DISCUSSION

During the past 15 years, many interventions for informal dementia caregivers have been developed. Previous meta-analysis however examined mostly subsets of these interventions, focusing on certain types or interventions with specific characteristics. Consequently, it remained unclear to what extent the interventions work overall and if there are intervention characteristics which contribute to larger effects. The current study focused on a broad range of psychosocial and behavioral interventions and examined how effective they were overall and also explored the influence of intervention characteristics on this effectiveness. Despite some heterogeneity, the results concerning the mean effects show consistency across intervention effects: the pooled effects on burden, depression, quality of life, stress, sense of competence were small and in favor of the intervention groups. The pooled effect size for the outcome anxiety was not significant. The meta-regressions showed that these small effects were (mostly) independent of the number of sessions the intervention utilized, whether or not the intervention was delivered face-to-face, type of intervention, content, materials,

whether or not the intervention was adaptable/tailored to the participant, whether or not it was a group intervention, and the location where the intervention took place.

Overall, previous meta-analyses involving interventions for informal caregivers found (significant) small to moderate effect sizes: Dharmawardene et al.¹⁵ found that meditative interventions were able to significantly (with small to moderate effects) reduce caregiver depression, anxiety, stress, and heighten self-efficacy, and quality of life, but they found no significant effects for caregiver burden. Backhouse et al.¹⁶ found that care-coordinating interventions were effective (small to moderate effects) in reducing caregiver burden, but not in improving mood, quality of life, or heightening social support. Jensen et al.¹⁷ found that educational interventions were effective in reducing caregiver burden (moderate effect) and depression (small effect). Abrahams et al.¹⁴ found that 15 multicomponent interventions for co-residing caregivers were able to lower depression and burden, and heighten health and social support (small to moderate effects). However, all of these meta-analyses included only one specific type of intervention, and included only three to 10 studies, leading to low statistical power. In addition, the 95% confidence intervals were wide, indicating relatively weak evidence of overall effectiveness. An older meta-analysis¹⁹ with 30 original studies, did examine all interventions, irrespective of the type or a specific subgroup, and found overall significant small effects on all psychosocial outcome measures. Our findings (based on 60 studies) are largely in line with these previous meta-analyses and show that interventions, irrespective of the type, or intended outcome, yield small effects.

The absence of large effects can be explained in different ways. Caregiving has a great impact on the caregiver's life.³⁷ Some caregivers become homebound in this process, face difficulties maintaining or keeping employment, and feel that caregiving is a 24/7 job, without access to vacation days. While psychological interventions can help caregivers gain knowledge about dementia and help them to develop skills or learn how to treat people with dementia, the fact that providing care for someone with dementia can be a 24/7 job remains a major challenge. In addition, caregiving can be emotional challenging: some caregivers state that having a spouse or relative with dementia feels like a long mourning process, where they take leave from the person with dementia step by step. Researchers and clinicians may underestimate the enormous impact caregiving has on a caregiver, assuming that the problems caregivers face may be solved by (short) psychological interventions. As found in the current study, these interventions often produce small effects thereby raising some questions about their usefulness. Future research should explore other options to aid caregivers in their task, ideally together with the caregivers, because the caregivers can really point out what they need. It might be useful to start with a needs assessment to be able to tailor the interventions, and to develop person-centered interventions. In addition, these altered interventions may include respite care (which we did not review in the current study), since these interventions seem promising.³⁸ On the other hand, it may be useful to work towards a more continuous care

plan, starting from the dementia diagnosis through all the dementia stages (which typically cause different problems), instead of only examining short, separate interventions. The current interventions, which yield small effects, can however provide guidelines or a basis for developing more effective interventions. These more effective interventions ideally sort larger effects on the (different aspects of) well-being of the caregiver, which in turn might lead to better care for the persons with dementia, so they can stay at home longer with better quality of life.

To pinpoint intervention characteristics associated with larger effects, we employed several meta-regressions, based on the intervention taxonomy by Schulz et al.²⁰ and the recommendations by Gaugler et al.¹⁸. However, we found no significant moderators. Some previous meta-analyses also investigated potential moderator variables, and these yielded mixed results: interventions delivered by a case manager with a nursing background were found to be more effective in heightening quality of life compared to those delivered by professionals with other backgrounds among four care-coordinating interventions;¹⁶ shorter interventions were found to sort larger effects on caregiver burden than longer interventions (among five educational interventions),¹⁷ and involvement of both the person with dementia and the caregiver in the intervention may be associated with larger effect sizes on caregiver psychological morbidity.¹⁹ However, these findings were based on small samples of studies, leading to low statistical power, and should therefore be interpreted with caution. In addition, these predictors may not be associated with larger effects on different outcome measures across other subtypes of interventions (that is, they may not be 'consistent' predictors). Furthermore, all of these meta-analyses examined many predictors, and only a few were found to be significant. A systematic review of systematic reviews by Dickinson et al.³⁹ also aimed to determine which intervention aspects are most effective at maintaining the health of informal dementia caregivers. They concluded that the most effective interventions incorporated both an educational component, focused on enhancing carers' knowledge of dementia and the caring role, and included a therapeutic component. They also concluded that the effectiveness of interventions can be further increased if delivered in a support group format rather than individually, and that multi-component interventions also benefit the person with dementia. However, Dickinson et al.³⁹ completed a narrative evaluation of (a subset of) existing systematic reviews and meta-analysis, instead of performing a meta-analysis on the original studies. Furthermore, the reviews included in Dickinson et al.³⁹ varied in their scope and inclusion criteria, and most of them did not examine predictors, but instead only included specific types of interventions. Dickinson et al.³⁹ did not take these limitations into consideration, which is why these results should be interpreted with caution. To summarize, the small intervention effects (found in both the current and previous studies) are likely to be independent of intervention characteristics as defined by Gaugler et al.¹⁸ and Schulz et al.²⁰.

The current study had several limitations. First, not all included studies reported detailed information about the intervention used, and some authors failed to respond to e-mails asking for this information, causing us to rely on (our interpretation of) the published information. However, this may have led to us categorizing studies as being psychoeducational, or support interventions, while the original authors intended otherwise. In addition, we may have wrongly assumed that interventions did not include specific content (for instance knowledge transfer) because this was not specified, while the original authors may have thought this to be self-evident. For instance, some interventions were called ‘psychoeducational’ by the original authors, but transfer of knowledge was not included in the intervention description. In addition, if nothing was specified regarding a moderator, this was coded as a missing value, which led to lower statistical power in the meta-regressions. To overcome these problems, future research should specify detailed information about the investigated interventions. Second, we focused only on the first follow-up measurement reported by the studies. However, this measurement was not at the same moment for all studies; for some it was immediately after completion of the intervention, and for some two weeks after completion. A third limitation was that the original studies varied in the questionnaires used to measure all the outcome measures. For example, the outcome burden was measured (across different studies) using the Revised Memory and Behavior Checklist, the Zarit Burden Scale, the Caregiver Satisfaction Scale, and the Caregiver Reaction Assessment. The questionnaires may measure (slightly) other aspects of burden and may as such not be entirely comparable. Another limitation is that only articles written in English were included, so eligible studies in other languages were missed. However, we still had a relatively large sample of studies, leading to sufficient statistical power.

Implications for practice and research

While the current study supports findings of other meta-analyses of dementia caregiver interventions,^{14-17,19} it adds to the literature because we included all types of psycho-behavioral and psychoeducational interventions for informal caregivers, instead of relying on a specific subset. As a result, we have a complete overview of (the effectiveness of) interventions, on a variety of outcomes, generalizable to all informal dementia caregivers. Our findings suggest that there are consistent small intervention effects across all interventions, irrespective of intervention characteristics.

The challenges informal dementia caregivers face might be underestimated and may therefore not be (entirely) solvable with psycho-behavioral and educational interventions. Clinical practice with informal caregivers should be aware of these findings: the interventions may aid the caregivers to some extent, but they may need more in order to be really helped in their caregiving role. We found that several studies did not report details about the interventions, which makes comparison across studies difficult. Future research should report more

details about the used interventions, to make it easier to compare the interventions and execute meta-regressions using these details. In addition, future research should explore the effectiveness of interventions complemented with other components, including for example respite care. Other ways to enhance interventions would be to personalize these, and to develop a continuous care plan, to be able to offer caregivers help through all dementia stages. This might in turn increase the effectivity of interventions and ultimately enhance the lives of informal dementia caregivers and the people with dementia they care for.

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Table 1 Overview of the included studies

| First author (year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Moderators | | | |
|---|--|----------------------------|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|--|---|------------|--------------------|
| | | | | | | | | | Content | Materials | Adaptable? | Location |
| Bourgeois (2002), United States ²⁵ | Burden, Depression, Anxiety, Distress, | CSS, CES-D, STAI, PSS, CSE | 41 (21, 20) | Psychoeducational | Face-to-face | ND | 12 | Mixed | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Feedback to participant | Information sheet/ checklists/ pamphlets | Yes | Participants' home |
| Burgio (2003), United States ⁴⁰ | Self-efficacy Burden, Depression, | RMBPC, CES-D, STAI | 119 (61, 57) | Psychotherapy | Face-to-face | 11 | 24 | Mixed | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Feedback to participant, Cognitive restructuring | Manual/workbook, Videotapes/DVDs | Yes | Participants' home |
| Coon (2003), United States ³⁶ | Anxiety Depression, Self-efficacy | MAACL-D, RSCSE | 116 (64, 52) | Psychoeducational | Face-to-face | 10 | 16 | Yes | Knowledge, Behavioral skills, Problem-solving skills | Manual/workbook, Homework/ assignments | Yes | Research facility |
| Eisdorfer (2003), United States ⁴¹ | Depression | CES-D | 97 (55, 42) | Psychotherapy | Face-to-face | 13 | 24 | No | Behavioral skills, Self-efficacy techniques, Feedback to participant, Counseling, Cognitive restructuring | Manual/workbook, Homework/ assignments | Yes | Participants' home |
| Gitlin (2003), United States ⁴² | Burden, Self-efficacy | RMBPC, CMI | 190 (89, 89) | Multicomponent | Face-to-face | 6 | 24 | No | Knowledge, Behavioral skills, Problem-solving skills, Feedback to participant, Counseling | Information sheet/ checklists/ pamphlets, Assistive devices | Yes | Participants' home |
| Hebert (2003), Canada ⁴³ | Burden, Anxiety, Self-efficacy | RMBPC, STAI, ISSB-PES | 118 (60, 58) | Multicomponent | Face-to-face | 15 | 15 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Feedback to participant, Counseling | Manual/workbook | Yes | Research facility |
| Huang (2003), Taiwan ⁴⁴ | Self-efficacy | AMSS | 48 (24, 24) | Psychoeducational | Face-to-face | 2 | 2 | No | Problem-solving skills, Stress management techniques, Self-efficacy techniques, Social support/engagement, Cognitive restructuring | Manual/workbook | Yes | Participants' home |
| Mahoney (2003), United States ⁴⁵ | Burden, Depression, Anxiety | RMBPC, CES-D, STAI | 100 (49, 51) | Multicomponent | E-health | NA | 52 | No | Knowledge, Behavioral skills, Stress management techniques, Feedback to participant, Counseling | Manual/workbook, Assistive devices | Yes | Participants' home |

Table 1 Overview of the included studies (continued)

| First author (year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Moderators | | | | | | | | |
|---|--|---|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|--|---|------------|--------------------|
| | | | | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Content | Materials | Adaptable? | Location |
| Senarong (2004), Thailand ⁴¹ | Distress | NPI+Distress | 50 (25, 25) | Multicomponent | Face-to-face | 5 | 24 | Yes | Knowledge, Behavioral skills, Social support/engagement, Counseling | Manual/workbook | Yes | Research facility |
| Beauchamp (2005), United States ⁴⁸ | Burden, Depression, Anxiety, Distress, Self-efficacy | CSS, CES-D, STAI, Self-made item (stress), Self-made item (self-efficacy) | 299 (50, 149) | Psychoeducational | E-health | NA | 4 | No | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques | Information sheet/checklists/pamphlets, Videotapes/DVDs, Homework/assignments | Yes | Participants' home |
| Hepburn (2006), United States ⁴⁹ | Self-efficacy Burden | ZBS, PMS | 166 (120, 46) | Psychoeducational | Face-to-face | 6 | 6 | Yes | Knowledge, Behavioral skills | Homework/assignments | No | Other |
| Finkel (2007), United States ⁵⁰ | Self-efficacy Burden | RMBPC, CES-D | 38 (19, 19) | Multicomponent | Telephone | 14 | 24 | Mixed | Knowledge, Behavioral skills, Social support/engagement | Assistive devices | No | Participants' home |
| Hepburn (2007), United States ⁴⁹ | Depression Distress | PDS, PMS | 52 (30, 22) | Psychoeducational | Face-to-face | 6 | 22 | Yes | Knowledge, Stress management techniques | Manual/workbook, Videotapes/DVDs | No | Research facility |
| Marquez-Gonzalez (2007), Spain | Self-efficacy Burden | RMBPC, CES-D | 74 (34, 40) | Psychotherapy | Face-to-face | 8 | 8 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Cognitive restructuring assignments | Manual/workbook, Homework/assignments | Yes | Research facility |
| Ulstain (2007), Norway ⁵¹ | Depression Distress | RSS | 171 (87, 84) | Psychoeducational | Face-to-face | 7 | 31.5 | Yes | Knowledge, Behavioral skills, Problem-solving skills | Assistive devices | No | Research facility |
| Winter (2007), United States ⁵² | Burden | ZBS, CES-D | 103 (58, 45) | Support | Telephone | 14.8 | 24 | Yes | Social support/engagement | Assistive devices | Yes | Participants' home |
| Charlesworth (2008), United Kingdom ⁵³ | Depression Anxiety | HADS-D, HADS-A, EQSD | 236 (116, 120) | Support | Face-to-face | 24 | 24 | No | Stress management techniques, Self-efficacy techniques, Social support/engagement | none | Yes | Participants' home |
| Chen (2008), Hong Kong ⁵⁴ | QoL Burden, QoL | CBi, WHOQOL | 88 (44, 44) | Multicomponent | Face-to-face | 12 | 24 | Mixed | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques/Social support/engagement | none | Yes | Research facility |

Table 1 Overview of the included studies (continued)

| First author (Year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Moderators | | | |
|--|---------------------------|----------------------------|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|--|--|------------|--------------------|
| | | | | | | | | | Content | Materials | Adaptable? | Location |
| Signe (2008), Sweden ⁶⁰ | Burden | CBS | 308 (153, 155) | Multicomponent | Face-to-face | 11 | 17 | Yes | Knowledge, Behavioral skills, Social support/engagement | Information sheet/checklists/pamphlets | Yes | Participants' home |
| Tremont (2008), United States ⁵⁷ | Burden | ZBI, GDS | 33 (16, 17) | Multicomponent | Telephone | 23 | 52 | No | Knowledge, Behavioral skills, Problem-solving skills, Social support/engagement | Manual/workbook, Assistive devices | Yes | Participants' home |
| Fortinsky (2009), United States ⁵⁸ | Depression, Burden | ZBS, CES-D, Self-made item | 84 (54, 30) | Multicomponent | Face-to-face | 12 | 52 | No | Knowledge, Self-efficacy techniques, Social support/engagement, Counseling | Information sheet/checklists/pamphlets | Yes | Participants' home |
| Gavrilova (2009), Russia ⁵⁹ | Self-efficacy, Burden | ZBI, WHO-QOL-bref | 53 (25, 28) | Psychoeducational | Face-to-face | 5 | 5 | No | Knowledge, Behavioral skills, Counseling | Manual/workbook, Videotapes/DVDs | Yes | Participants' home |
| Martin-Carrasco (2009), Spain ⁶⁰ | QoL, Burden | ZBS | 120 (60, 60) | Multicomponent | Face-to-face | 8 | 16 | No | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Cognitive restructuring | Information sheet/checklists/pamphlets | Yes | Research facility |
| Au (2010), Hong Kong ⁶¹ | Depression, Self-efficacy | CES-D, RSCSE | 27 (13, 14) | Multicomponent | Face-to-face | 13 | 13 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Feedback to participant, Cognitive restructuring | Manual/workbook | ND | Research facility |
| Gallagher-Thompson (2010), United States ⁶² | Burden | RMBPC, CES-D | 70 (36, 34) | Psychoeducational | E-health | NA | 12 | No | Knowledge, Behavioral skills | Videotapes/DVDs | No | Participants' home |
| Gitlin (2010), United States ⁶³ | Depression, Burden | ZBS | 239 (117, 122) | Psychotherapy | Face-to-face | 16 | 11 | No | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Counseling | Information sheet/checklists/pamphlets, Homework/assignments | Yes | Participants' home |
| Kurz (2010), Germany ⁶⁴ | Depression, QoL | ZBS | 292 (156, 136) | Psychoeducational | Face-to-face | 13 | 60 | Yes | Knowledge | Manual/workbook | Yes | Research facility |
| Pahlavanzadeh (2010), Iran ⁶⁵ | Burden | ZBS | 50 (25, 25) | Psychoeducational | Face-to-face | 5 | 5 | Yes | Knowledge | none | No | Research facility |
| van der Roest (2010), The Netherlands ⁶⁶ | QoL, Self-efficacy | QOL-AD, SSCQ | 28 (14, 14) | Psychoeducational | E-health | NA | 8 | No | Knowledge | Internet | No | Participants' home |

Table 1 Overview of the included studies (continued)

| First author (year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Moderators | | | |
|--|------------------------------|---------------------------------|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|---|--|------------|--------------------|
| | | | | | | | | | Content | Materials | Adaptable? | Location |
| Chien (2011), Hong Kong ⁶⁸ | Burden, QoL | CBI, WHO-QoL-bref | 92 (46, 46) | Multicomponent | Face-to-face | 10 | 20 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Social support/engagement | Information sheet/ checklists/ pamphlets | Yes | Participants' home |
| Ducharme (2011), Canada ⁶⁹ | Distress, Self-efficacy | PDI, RSCSE | 97 (61, 36) | Psychoeducational | Face-to-face | 7 | 24 | No | Knowledge, Behavioral skills, Self-efficacy techniques | Manual/workbook, Homework/assignments | No | Participants' home |
| Guerra (2011), Peru ⁷⁰ | Burden, QoL | ZBI, WHO-QoL-bref, NPI-Distress | 57 (28, 29) | Psychoeducational | Face-to-face | 5 | 5 | No | Knowledge, Behavioral skills, Counseling | Manual/workbook, Videotapes/DVDs | Yes | Participants' home |
| Kouri (2011), Canada ⁷¹ | Distress | RMBPC, RSCSE | 50 (25, 25) | Psychoeducational | Face-to-face | 5 | 5 | No | Knowledge, Behavioral skills, Self-efficacy techniques | none | No | ND |
| Losada (2011), Spain ⁷² | Self-efficacy, Depression | CES-D | 118 (68, 50) | Psychotherapy | Face-to-face | 12 | 12 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Counseling, Cognitive restructuring | Homework/assignments | No | ND |
| Joling (2012), The Netherlands ²⁶ | Burden, Depression, Anxiety | CRA, CES-D, HADS-A, SF-12 | 192 (96, 96) | Multicomponent | Face-to-face | 6 | 52 | Mixed | Knowledge, Problem-solving skills, Social support/engagement, Counseling | Manual/workbook | Yes | Participants' home |
| Wang (2012), China ³⁵ | QoL | WHOQOL-bref, NPI-Distress | 78 (39, 39) | Multicomponent | Face-to-face | 12 | 24 | Yes | Knowledge, Behavioral skills, Problem-solving skills, Social support/engagement | Manual/workbook | Yes | Research facility |
| Czaja (2013), United States ³³ | Distress, Burden, Depression | RMBPC, CES-D | 93 (30, 63) | Multicomponent | Telephone | 6 | 20 | Mixed | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Social support/engagement | Videotapes/DVDs, Assistive devices | Yes | Participants' home |
| Huang (2013), Taiwan ¹⁴ | Self-efficacy | CCS | 129 (63, 66) | Multicomponent | Face-to-face | 2 | 3 | No | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Self-efficacy techniques, Cognitive restructuring | Information sheet/ checklists/ pamphlets | Yes | Participants' home |

Table 1 Overview of the included studies (continued)

| First author (year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Moderators | | | |
|--|---|---------------------|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|--|--|------------|---------------------------------------|
| | | | | | | | | | Content | Materials | Adaptable? | Location |
| Kwok (2013), Hong Kong ¹⁶ | Burden, | ZBI, RSCSE | 38 (18, 20) | Psychoeducational | Telephone | 12 | 12 | No | Knowledge, Behavioral skills | Assistive devices | No | Participants' home |
| Livingston (2013), United Kingdom ¹⁷ | Self-efficacy Depression, Anxiety | HADS-D, HADS-A | 259 (172, 87) | Psychotherapy | Face-to-face | 8 | 8 | No | Knowledge, Behavioral skills, Self-efficacy techniques, Cognitive restructuring | Manual/workbook, Audiotapes/ CDs, Homework/ assignments | Yes | According to participants' preference |
| Martindale-Adams (2013), United States ¹⁸ | Burden, | ZBI, CES-D | 154 (77, 77) | Multicomponent | Telephone | 14 | 24 | Mixed | Knowledge, Behavioral skills, Problem-solving skills, Social support/engagement | Manual/workbook, Assistive devices | Yes | Participants' home |
| Dowling (2014), United States ¹⁹ | Depression Burden, Depression, | ZBI, CES-D, PSS | 24 (12, 12) | Psychoeducational | Face-to-face | 6 | 6 | No | Knowledge, Behavioral skills, Problem-solving skills, Self-efficacy techniques | Information sheet/checklists/pamphlets, Homework/ assignments | Yes | Participants' home |
| Gonzalez (2014), United States ²⁷ | Distress Burden, Depression, | GRS, CES-D, STAI | 102 (50, 52) | Psychoeducational | Face-to-face | 6 | 6 | Yes | Knowledge, Behavioral skills, Problem-solving skills | Information sheet/checklists/pamphlets | Yes | Research facility |
| Martin-Carrasco (2014), Spain ⁸⁰ | Anxiety Burden, | ZBI, SF-12 | 238 (115, 123) | Multicomponent | Face-to-face | 7 | 14 | Yes | Knowledge, Behavioral skills | Manual/workbook | No | Other |
| Pagan-Ortiz (2014), Mexico ⁸¹ | QoL Burden, Depression, | ZBS, CES-D, PMS | 32 (15, 17) | Psychoeducational | E-health | 4 | 4 | Yes | Knowledge | Internet, Videotapes/DVDs | No | Participants' home |
| Blom (2015), The Netherlands ⁸² | Self-efficacy Depression, Anxiety | CES-D, HADS-A | 245 (149, 96) | Multicomponent | E-health | 9 | 24 | No | Knowledge, Behavioral skills, Problem-solving skills, Feedback to participant, Cognitive restructuring | Information sheet/checklists/pamphlets, Videotapes/DVDs, Internet, Homework/ assignments | No | Other |
| Chiu (2015), Canada ⁸³ | Burden, Distress, Self-efficacy | ZBI, PSS, CCS | 54 (28, 26) | Psychoeducational | Face-to-face | 3 | 3.5 | No | Knowledge, Problem-solving skills, Feedback to participant | Information sheet/checklists/pamphlets | Yes | Participants' home |

Table 1 Overview of the included studies (continued)

| First author (year of publication), country | Outcome variables | Instrument(s) | N (intervention, control) | Intervention type | Delivery modality | Number of sessions | Duration (in weeks) | Group intervention? | Moderators | | | |
|--|-----------------------------------|---|---------------------------|-------------------|-------------------|--------------------|---------------------|---------------------|---|--|------------|--------------------|
| | | | | | | | | | Content | Materials | Adaptable? | Location |
| Gallagher-Thompson (2015), United States ⁸⁵ | Burden, Depression | RMBPC, CES-D | 110 (55, 55) | Psychoeducational | Other | ND | 24 | Mixed | Knowledge | Manual/workbook | No | Participants' home |
| Gaugler (2015), United States ⁸⁶ | Depression, QoL | GDS, Cantril ladder | 107 (54, 53) | Multicomponent | Face-to-face | 6 | 16 | Mixed | Knowledge, Social support/engagement, Counseling | Information sheet/checklists/pamphlets | Yes | Participants' home |
| Leach (2015), Australia ⁸⁷ | Depression, Anxiety | Webneuro-Depression, Web-neuro-Anxiety, AQoL-8D | 17 (8, 9) | Psychoeducational | Face-to-face | 12 | 12 | Yes | Knowledge, Behavioral skills | none | No | Research facility |
| Losada (2015), Spain ⁸⁴ | QoL, Depression, Anxiety | CES-D, POMS-A | 61 (31, 30) | Psychotherapy | Face-to-face | 8 | No | No | Behavioral skills, Stress management techniques, Cognitive restructuring | none | Yes | Participants' home |
| Xiao (2016), Australia ⁸⁸ | QoL, Distress | SF-36, NPI-Distress, SSCQ | 61 (nt = 31, cont = 30) | Psychoeducational | Face-to-face | 11 | 24 | No | Knowledge, Behavioral skills | Information sheet/checklists/pamphlets, Homework/assignments | No | Participants' home |
| Núñez-Naveira (2016), Denmark, Spain, and Poland ⁸⁹ | Self-efficacy, Depression, Burden | CES-D, CCS | 61 (31, 30) | Psychoeducational | E-health | NA | 12 | No | Knowledge, Stress management techniques | Videotapes/DVDs, Audiotapes/CDs, Internet | Yes | Other |
| Söylemez (2016), Turkey ⁹⁰ | Self-efficacy, Depression | CBI, BDI, WHO-QOL-bref | 70 (35, 35) | Psychoeducational | Face-to-face | 4 | 12 | No | Knowledge, Behavioral skills | Manual/workbook, Information sheet/checklists/pamphlets | Yes | Participants' home |
| Wilz (2016), Germany ⁹¹ | QoL, Depression | CES-D | 146 (102, 44) | Psychotherapy | Telephone | 7 | 12 | No | Knowledge, Behavioral skills, Problem-solving skills, Stress management techniques, Self-efficacy techniques, Counseling, Cognitive restructuring | Manual/workbook, Homework/assignments | Yes | Other |

Note: AMSS, Agitation Management Self-efficacy Scale; AQoL-8D, Assessment of Quality of Life 8-dimensions; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory-II; CBS, Caregiver Burden Scale; CBI, Caregiver Burden Inventory; CCS, Caregiver Competence Scale; CES-D, Center for Epidemiological Studies Depression Scale; CMI, Caregiver Mastery Index; CRS, Caregiver Role Strain; GSE, Caregiver Self-efficacy Scale; CSS, Caregiver Satisfaction Scale; EQ-5D, Euroqol - 5 Dimensions; GDS, Geriatric Depression Scale; GSE, General Self-efficacy scale; HADS - A/D, Hospital Anxiety and Depression Scale - Anxiety/Depression; ISSB-PES, Inventory of Socially Supportive Behavior - Personal Efficacy Scale; MAACL-D, Multiple Affect Adjective Checklist - Depression; NA, Not Applicable; ND, Not Described; NPI, Neuropsychiatric Inventory; PDI, Psychological Distress Inventory; PDS, Patient Distress Scale; PMS, Personal Mastery Scale; PSS, Perceived Stress Scale; QoL-AD, Quality of life in Alzheimers Disease; RMBPC, The Revised Memory and Behavior Problems Checklist; RSCSE, Revised Scale for Caregiving Self-Efficacy; RSS, Relatives Stress Scale; SF-12, Short-Form 12 Items; SF-36, Short-Form-36 items; SSCQ, Short Sense of Competence Questionnaire; STAI, State-Trait Anxiety Inventory, Web-neuro-Depression/Anxiety, Webneuro test battery-Depression/Anxiety; WHOQOL (bref), World Health Organization Quality of Life (abbreviated); ZBI, Zarit Burden Inventory; ZBS, Zarit Burden Scale.

Supplementary Table S1 Search per engine

| Medline in PubMed | EBSCO Host | Cochrane Library | EMBASE |
|--|-------------------|--------------------------|--------------------------------|
| ((((((((("Caregivers"[Mesh]) OR caregivers) OR caregiver) OR care givers) OR care giver) OR carers) OR carer)) AND (((informal) OR family) OR casual) OR non-professional)) AND ("Dementia"[Mesh] OR dementia OR Alzheimer OR Alzheimers)) AND (((intervention) OR training) OR support) OR treatment) | Caregivers | Caregivers [MeSH] | 'caregiver'/exp [EMtree terms] |
| | Caregiver | Caregiver | 'caregiver' |
| | Care givers | ((care) near/3 (givers)) | 'care *3 givers' |
| | Care giver | ((care) near/3 (giver)) | 'care *3 giver' |
| | Carers | Carers | 'carers' |
| | Carer | Carer | 'carer' |
| | Informal* | informal* | 'informal**' |
| | famil* | famil* | 'famil**' |
| | casual* | casual* | 'casual**' |
| | non-professional* | non-professional* | 'non-professional**' |
| | Dementi* | Dementia [MeSH] | 'dementia'/exp [EMtree terms] |
| | Alzheimer* | dementi* | 'dementi**' |
| | Alzheimers* | Alzheimer* | 'Alzheimer**' |
| Interventi* | Alzheimers* | 'Alzheimer/s**' | |
| Training* | Interventi* | 'interventi**' | |
| Support* | Training | 'training' | |
| Treatment* | Support | 'support' | |
| | Treatment | 'treatment' | |
| | | :ti,ab | |
| | | AND [embase]/lim | |
| | | NOT [medline]/lim. | |

Note. Searches were performed on January 27, 2017, limited to title/abstract and from 2002 onwards.

Supplementary Table S2 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome burden

| Predictor | k | Intercept | Slope coefficient | SE | P-value | 95% CI | Q _M | Q _E | I ² | F | R ² |
|------------------------------|----|-----------|-------------------|------|---------|------------|----------------|----------------|----------------|--------|----------------|
| Intervention type | 35 | -0.26 | | | | | 2.63 | 50.27* | 0.02 | 28.44% | 0.00% |
| Psychoeducational | | | 0.12 | 0.09 | .170 | -0.05;0.30 | | | | | |
| Support | | | 0.25 | 0.24 | .295 | -0.22;0.73 | | | | | |
| Psychotherapy | | | 0.04 | 0.14 | .784 | -0.23;0.31 | | | | | |
| Content | 35 | 0.19 | | | | | 12.47* | 40.68 | 0.04 | 9.75% | 71.59% |
| Knowledge | | | -0.12 | 0.20 | .534 | -0.51;0.26 | | | | | |
| Skill training | | | -0.19 | 0.15 | .198 | -0.49;0.10 | | | | | |
| Support | | | -0.15 | 0.08 | .070 | -0.31;0.01 | | | | | |
| Feedback | | | 0.11 | 0.11 | .308 | -0.10;0.33 | | | | | |
| Cognitive counseling | | | -0.14 | 0.08 | .090 | -0.30;0.02 | | | | | |
| Materials used | 35 | -0.26 | | | | | 3.19 | 50.42* | 0.02 | 34.28% | 0.00% |
| Written information | | | 0.04 | 0.09 | .616 | -0.14;0.23 | | | | | |
| Assistive devices | | | -0.04 | 0.09 | .647 | -0.22;0.13 | | | | | |
| Homework | | | 0.17 | 0.10 | .103 | -0.03;0.37 | | | | | |
| Adaptability | 35 | -0.10 | | | | | 1.98 | 51.75* | 0.01 | 24.37% | 19.31% |
| Intervention duration | | | -0.13 | 0.10 | .159 | -0.03;0.05 | | | | | |
| Group intervention | | | -0.03 | 0.03 | .314 | -0.01;0.01 | | | | | |
| Location | | | 0.06 | 0.09 | .555 | -0.12;0.22 | | | | | |
| Multicomponent intervention* | | | -0.09 | 0.09 | .329 | -0.27;0.09 | | | | | |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention'. Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included). Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other).

* $p < .05$, ** $p < .01$.

Supplementary Table S3 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome depression

| Predictor | k | Intercept | Slope coefficient | SE | p-value | 95%CI | Q _m | Q _E | I ² | I | R ² |
|-----------------------|----|-----------|-------------------|------|---------|------------|----------------|----------------|----------------|--------|----------------|
| Intervention type | 34 | -0.20 | | | | | 1.87 | 44.31* | 0.02 | 33.29% | 0.00% |
| Psychoeducational | | | -0.01 | 0.10 | .904 | -0.21;0.19 | | | | | |
| Support | | | 0.12 | 0.17 | .474 | -0.21;0.45 | | | | | |
| Psychotherapy | | | 0.12 | 0.12 | .307 | -0.11;0.36 | | | | | |
| Content | 34 | 0.07 | | | | | 4.24 | 39.26 | 0.01 | 25.99% | 5.36% |
| Education | | | -0.11 | 0.14 | .435 | -0.38;0.16 | | | | | |
| Skill training | | | -0.16 | 0.11 | .173 | -0.37;0.07 | | | | | |
| Support | | | -0.03 | 0.10 | .796 | -0.23;0.17 | | | | | |
| Feedback | | | 0.10 | 0.12 | .411 | -0.14;0.34 | | | | | |
| Cognitive counseling | | | -0.06 | 0.09 | .504 | -0.24;0.12 | | | | | |
| Materials used | 34 | -0.18 | | | | | 0.08 | 46.24* | 0.02 | 35.60% | 0.00% |
| Written information | | | 0.002 | 0.10 | .984 | -0.19;0.20 | | | | | |
| Assistive devices | | | 0.03 | 0.09 | .777 | -0.15;0.20 | | | | | |
| Homework | | | 0.02 | 0.09 | .986 | -0.17;0.18 | | | | | |
| Adaptability | | | 0.01 | 0.10 | .937 | -0.19;0.20 | 0.01 | 46.39* | 0.02 | 30.52% | 0.00% |
| Intervention duration | 34 | -0.22 | | | | | 1.01 | 44.13 | 0.01 | 24.93% | 14.07% |
| Group intervention | 34 | -0.22 | | | | | 1.47 | 44.20 | 0.01 | 26.31% | 8.95% |
| Location | 34 | -0.16 | | | | | | | | | |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention' (Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included). Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other). The significant outlier was excluded from the meta-regressions.

*p < .05, **p < .01.

Supplementary Table S4 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome anxiety

| Predictor | k | Intercept | Slope coefficient | SE | P-value | 95% CI | Q _{in} | Q _e | I ² | F | R ² |
|-----------------------|----|-----------|-------------------|------|---------|-------------|-----------------|----------------|----------------|--------|----------------|
| Intervention type | 14 | -0.15 | | | | | 0.56 | 22.88* | 0.05 | 58.06% | 0.00% |
| Psychoeducational | | | 0.09 | 0.21 | .648 | -0.31;0.50 | | | | | |
| Support | | | 0.01 | 0.31 | .968 | -0.59;0.61 | | | | | |
| Psychotherapy | | | -0.06 | 0.22 | .766 | -0.49;0.36 | | | | | |
| Content | 14 | -0.32 | | | | | 4.56 | 16.81 | 0.03 | 45.94% | 0.00% |
| Knowledge | | | 0.30 | 0.18 | .104 | -0.06;0.65 | | | | | |
| Support | | | 0.14 | 0.17 | .422 | -0.20;0.47 | | | | | |
| Feedback | | | 0.21 | 0.17 | .217 | -0.12;0.53 | | | | | |
| Cognitive counseling | | | -0.20 | 0.16 | .213 | -0.50;0.11 | | | | | |
| Materials used | 14 | -0.25 | | | | | 5.99 | 15.43 | 0.02 | 32.88% | 31.28% |
| Written information | | | 0.24 | 0.19 | .205 | -0.13;0.61 | | | | | |
| Assistive devices | | | 0.15 | 0.15 | .310 | -0.14;0.45 | | | | | |
| Homework | | | -0.34 | 0.15 | .023* | -0.64;-0.04 | | | | | |
| Adaptability | 14 | -0.30 | | | | | 1.67 | 21.77* | 0.03 | 45.75% | 0.00% |
| Intervention duration | | | -0.22 | 0.17 | .196 | -0.11;0.54 | | | | | |
| Group intervention | | | 0.03 | 0.05 | .559 | -0.01;0.01 | | | | | |
| Location | | | 0.18 | 0.12 | .127 | -0.05;0.42 | | | | | |
| Intervention duration | | | -0.19 | 0.12 | .127 | -0.05;0.42 | | | | | |
| Group intervention | | | -0.12 | 0.18 | .968 | -0.34;0.34 | | | | | |
| Location | | | -0.01 | 0.18 | .968 | -0.34;0.34 | | | | | |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention'. The category 'skill training' was empty and therefore omitted. Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included). Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other).

* $p < .05$, ** $p < .01$.

Supplementary Table S5 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome quality of life

| Predictor | k | Intercept | Slope coefficient | SE | P-value | 95% CI | Q _{hi} | Q _e | I ² | F | R ² |
|-----------------------|----|-----------|-------------------|------|---------|------------|-----------------|----------------|----------------|--------|----------------|
| Intervention type | 14 | 0.23 | | | | | 0.09 | 21.08* | 0.03 | 45.84% | 0.00% |
| Psychoeducational | | | -0.01 | 0.15 | .966 | -0.29;0.31 | | | | | |
| Support | | | -0.07 | 0.26 | .788 | -0.57;0.43 | | | | | |
| Content | 14 | -0.18 | | | | | 3.61 | 13.06 | 0.02 | 33.51% | 3.61% |
| Knowledge | | | 0.16 | 0.25 | .526 | -0.34;0.66 | | | | | |
| Skill training | | | 0.22 | 0.26 | .170 | -0.10;0.54 | | | | | |
| Support | | | 0.12 | 0.15 | .425 | -0.18;0.2 | | | | | |
| Cognitive counseling | | | 0.11 | 0.15 | .463 | -0.18;0.39 | | | | | |
| Materials used | 14 | 0.18 | | | | | 3.02 | 16.62 | 0.03 | 42.65% | 0.00% |
| Written information | | | 0.04 | 0.17 | .798 | -0.28;0.37 | | | | | |
| Assistive devices | | | -0.12 | 0.19 | .517 | -0.50;0.25 | | | | | |
| Homework | | | 0.44 | 0.30 | .141 | -0.15;1.03 | | | | | |
| Adaptability | | | 0.08 | 0.16 | .615 | -0.24;0.40 | 0.25 | 20.41 | 0.03 | 40.56% | 0.00% |
| Intervention duration | 14 | 0.32 | | | | | 1.72 | 17.21 | 0.02 | 30.55% | 26.61% |
| Group intervention | 14 | 0.29 | | | | | 1.13 | 17.98 | 0.02 | 33.59% | 19.50% |
| Location | 14 | 0.01 | | | .004** | 0.09;0.48 | 8.48** | 12.63 | 0.00 | 0.00% | 100.00% |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention'. The category 'psychotherapy' was empty and therefore omitted. Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included). Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other). The significant outlier was excluded from the meta-regressions. *p < .05, **p < .01.

Supplementary Table S6 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome stress

| Predictor | k | Intercept | Slope coefficient | SE | P-value | 95% CI | Q _{hi} | Q _e | I ² | F | R ² |
|-----------------------|----|-----------|-------------------|------|---------|------------|-----------------|----------------|----------------|-------|----------------|
| Intervention type | 16 | -0.20 | 0.03 | 0.12 | .820 | -0.21;0.27 | 0.05 | 14.35 | 0.00 | 0.00% | 18.72% |
| Psychoeducational | | | | | | | | | | | |
| Content | 16 | -0.17 | -0.10 | 0.17 | .558 | -0.42;0.22 | 0.39 | 14.01 | 0.00 | 0.00% | 0.00% |
| Support | | | -0.04 | 0.15 | .777 | -0.32;0.24 | | | | | |
| Feedback | | | 0.03 | 0.12 | .826 | -0.21;0.26 | | | | | |
| Cognitive counseling | | | | | | | | | | | |
| Materials used | 16 | -0.05 | -0.24 | 0.13 | .052 | -0.49;0.00 | 3.78 | 10.62 | 0.00 | 0.00% | 100.00% |
| Written information | | | 0.09 | 0.12 | .475 | -0.15;0.32 | | | | | |
| Assistive devices | | | 0.01 | 0.11 | .937 | -0.21;0.22 | | | | | |
| Homework | | | | | | | | | | | |
| Adaptability | 16 | -0.16 | -0.03 | 0.11 | .801 | -0.24;0.19 | 0.06 | 14.34 | 0.00 | 0.01% | 0.00% |
| Intervention duration | | | -0.01 | 0.01 | .987 | -0.01;0.01 | <0.01 | 14.40 | 0.00 | 0.01% | 0.00% |
| Group intervention | | | 0.04 | 0.11 | .685 | -0.17;0.25 | 0.16 | 14.24 | 0.00 | 0.00% | 0.00% |
| Location | | | -0.04 | 0.11 | .726 | -0.25;0.18 | 0.12 | 14.28 | 0.00 | 0.01% | 0.00% |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention', the categories 'support interventions' and 'psychotherapy' were empty, and omitted. Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included), the categories 'knowledge', and 'skill training' were empty and therefore not included. Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other).

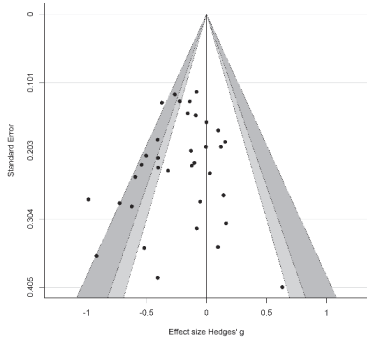
*p < .05, ** p < .01.

Supplementary Table S7 Results of the exploratory mixed-effects meta-regression analyses per moderator, for the outcome sense of competence

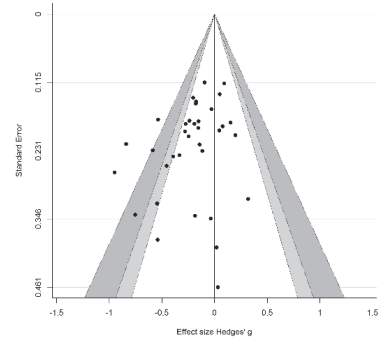
| Predictor | k | Intercept | Slope coefficient | SE | p-value | 95%CI | Q _h | Q _e | τ ² | I ² | R ² |
|-----------------------|----|-----------|-------------------|------|---------|------------|----------------|----------------|----------------|----------------|----------------|
| Intervention type | 20 | 0.32 | | | | | | | | | |
| Psychoeducational | | | 0.06 | 0.16 | .706 | -0.25;0.37 | 0.14 | 37.72** | 0.05 | 53.42* | 0.00% |
| Content | 20 | 0.74 | | | | | 2.60 | 33.34** | 0.06 | 55.89* | 0.00% |
| Skill training | | | -0.38 | 0.33 | .259 | -1.03;0.28 | | | | | |
| Support | | | -0.22 | 0.23 | .348 | -0.67;0.24 | | | | | |
| Feedback | | | -0.001 | 0.20 | .993 | -0.38;0.38 | | | | | |
| Cognitive counseling | | | 0.03 | 0.18 | .902 | -0.33;0.67 | | | | | |
| Materials used | 20 | 0.50 | | | | | 2.81 | 32.31** | 0.05 | 49.18% | 0.00% |
| Written information | | | -0.03 | 0.17 | .987 | -0.33;0.33 | | | | | |
| Assistive devices | | | -0.17 | 0.16 | .291 | -0.48;0.14 | | | | | |
| Homework | | | -0.20 | 0.15 | .184 | -0.50;0.10 | | | | | |
| Adaptability | 20 | 0.32 | 0.07 | 0.15 | .634 | -0.22;0.36 | 0.23 | 37.19** | 0.05 | 52.26% | 0.00% |
| Intervention duration | 20 | 0.45 | -0.01 | 0.01 | .277 | -0.01;0.01 | 1.18 | 35.83** | 0.05 | 50.95% | 0.00% |
| Group intervention | 20 | 0.42 | -0.18 | 0.15 | .238 | -0.48;0.12 | 1.39 | 35.43** | 0.05 | 49.95% | 0.75% |
| Location | 20 | 0.23 | 0.16 | 0.18 | .357 | -0.18;0.51 | 0.85 | 35.93** | 0.05 | 50.61% | 0.00% |

Note. Intervention type was a categorical variable, the reference category was 'multicomponent intervention', the categories 'support interventions' and 'psychotherapy' were empty, and omitted. Content and Materials used consisted of 5 and 3 moderators respectively, each was dummy coded (1 = included, 0 = not included), the category 'Knowledge' was empty and therefore not included. Adaptability was dummy coded (1 = adaptable, 0 = not adaptable to participants). Intervention duration was a continuous moderator, indicating the length of the intervention. Group intervention was dummy coded (1 = group intervention, 0 = individual intervention). Location was dummy coded (1 = participant's home/according to participant's preference, 0 = other). The significant outlier was excluded from the meta-regressions.

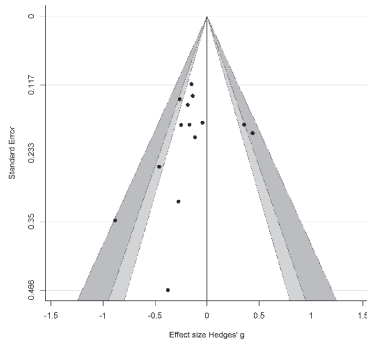
*p < .05, **p < .01.



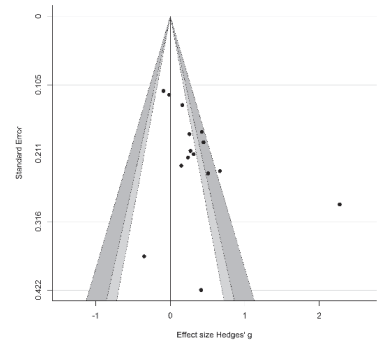
A Burden



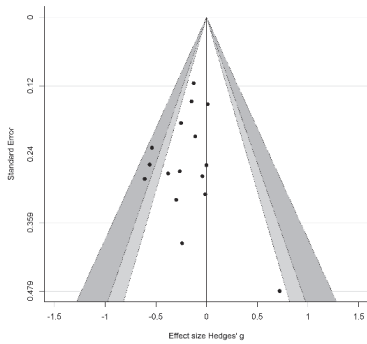
B Depression



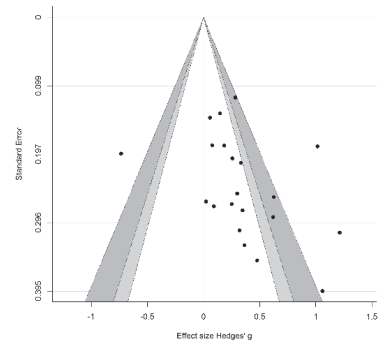
C Anxiety



D Quality of life

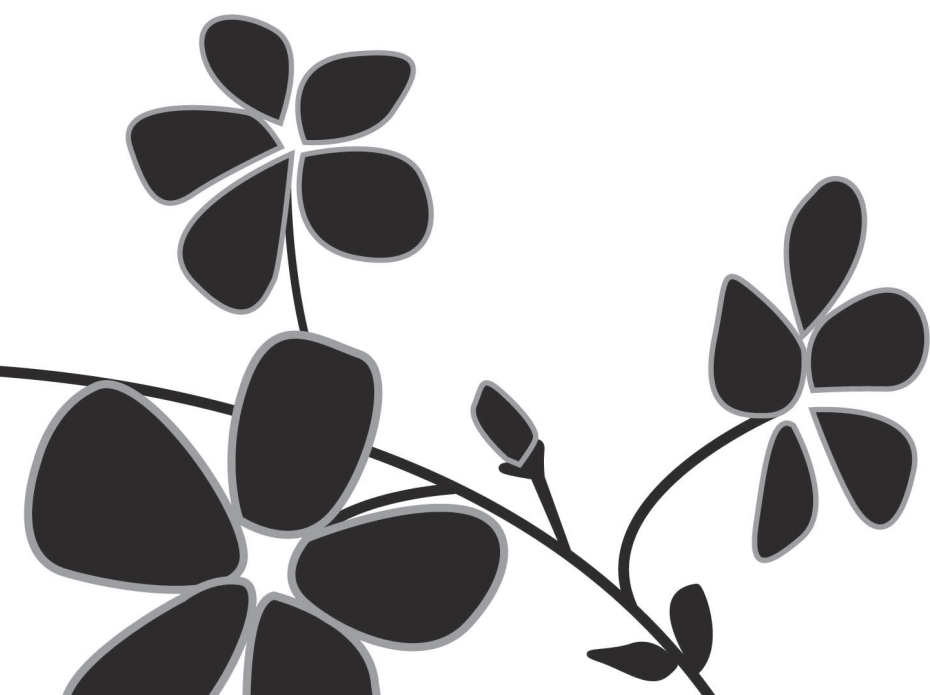


E Stress



F Sense of competence

Supplementary Figure 1 A - F Funnel plots for the outcomes burden, depression, anxiety, quality of life, stress, and sense of competence



CHAPTER 8

SUMMARY AND GENERAL DISCUSSION

BACKGROUND AND AIMS OF THE DISSERTATION

Informal caregivers provide the majority of daily care for persons with dementia who live at home. Informal caregivers are usually spouses or other family members of the person with dementia, and provide assistance with basic and instrumental activities of daily living, medical support, and they provide supervision, support, and comfort.¹ Informal caregivers make up a very heterogeneous group, differing from each other on various factors such as age, sex, and the type of relationship with the person with dementia, but also hours spent on caregiving, and which tasks they carry out. Informal caregiving is associated with negative consequences including higher rates of depression,^{2,3} anxiety,² stress,³ a lower general subjective well-being,³ and caregiver burden.⁴ On the other hand, some caregivers (also) experience positive consequences of caregiving; caregiver gains. The heterogeneity among caregivers and persons with dementia is a likely explanation as to why caregiving can have vastly different consequences for informal caregivers.

The first aim of this dissertation was to gain a better understanding of the current (neuro) psychological situation of informal dementia caregivers. In a cross-sectional study in *Chapter 2*, we aimed to get more insight into one of the relatively overlooked positive consequences of caregiving: heightened caregiver self-esteem. We explored which modifiable, psychological, variables predicted self-esteem, on top of non-modifiable (sociodemographic) factors. Next, we explored if caregivers perform similar, worse, or better than non-caregivers on tasks for episodic memory and executive functioning, while controlling for differences in age, educational level, and sex, in *Chapter 3*.

The second aim was to explore opportunities to improve the caregivers' lives. In *Chapter 4*, we examined whether, and how, empathy is linked to burden, depression, and anxiety in informal caregivers. Then, we described a study protocol for an intervention study in *Chapter 5*, examining the mixed virtual reality training Into D'mentia.⁵ In *Chapter 6*, a longitudinal, quasi-experimental analysis was performed to examine the effects of the Into D'mentia training on several outcomes including empathy, caregiver burden, depression, and anxiety at both group and individual level. Finally, in *Chapter 7*, meta-analyses were performed to examine the effectiveness of psychosocial and behavioral interventions for informal caregivers on burden, depression, anxiety, stress, quality of life, and sense of competence. Meta-regressions were employed to examine which intervention characteristics were associated with larger intervention effects.

Study design and data collection

This dissertation is based on data collected for the Into Dementia study, a quasi-experimental, longitudinal study in the Netherlands. Participants were recruited for three groups: an intervention group and two control groups. The intervention group ($n = 145$) and the first control group ($n = 56$) consisted of adult (18+) self-identified informal caregivers who spent at least eight hours on care per week for a loved one with dementia who lives at home. Caregivers of institutionalized persons were excluded, and caregivers whose loved one died, or moved to an institution during the study were considered drop-outs. Data were collected at baseline (pre-intervention), and at one week, 2.5 months, and 15 months after the intervention training. The second control group consisted 187 of non-caregiver control participants, matched on age, sex, and educational level with the caregivers. This group was tested only once, for baseline comparisons. *Chapter 2, 3, and 4* were based on the baseline data, and *Chapter 6* was based on all measurement points. For *Chapter 2* and *4*, the intervention group and the control group were merged to create one large group of informal caregivers. For *Chapter 3*, only the intervention group was used because the control group did not complete the neuropsychological assessments. The second (non-caregiver) control group was only included in *Chapter 3* and *4*. *Chapter 7* was a meta-analysis, based on data from other intervention studies.

AN OVERVIEW AND DISCUSSION OF KEY FINDINGS

PART I Positive aspects of the current (neuro)psychological situation of informal dementia caregivers

Chapter 2 showed that the sociodemographic factors age, sex, level of education, relationship with the person with dementia, hours spent on caregiving a week, and time since diagnosis did not predict caregiver self-esteem in the first block of a hierarchical multivariable regression analysis. A better perceived relationship with the care receiver, and fewer depression symptoms did predict self-esteem, even when adjusting for the aforementioned sociodemographic factors. It was noted that a more comprehensive definition for caregiver gains, of which self-esteem is only one aspect, is needed. In addition, a questionnaire assessing multiple aspects of gains, would be helpful to allow comparisons across studies and assist in replication of findings, because it is likely that different aspects of gains have different predictors.

Chapter 3 showed that caregivers performed better than non-caregivers on a task for (immediate) episodic memory when adjusting for age, sex, and educational level. Their scores on tasks for executive functioning did not differ from the scores of non-caregivers. Only male sex and higher social reliance scores predicted higher scores on Category Fluency,

an executive functioning task. The results contradicted previous research which suggested that caregiver's cognitive abilities would diminish because of the negative consequences of caregiving such as stress, burden, and depression.⁶⁻¹² Several explanations for our findings were presented, including that our sample had less burden and fewer depression and anxiety symptoms than often reported in previous studies. Maybe the overburdened and depressed caregivers have worse cognitive functioning, while the not-overburdened caregivers do not. This could not be examined, because the score ranges of burden, depression, and anxiety were small.¹³ Future research might look into this topic.

Remarkably, neither self-esteem nor cognition was (systematically) predicted by the sociodemographic characteristics of informal caregivers or the dementia-related variables in the multivariable analyses. Only the performance on one test for executive functioning (Category Fluency) was found to be predicted by male sex and higher scores on social reliance, whereas self-esteem was predicted by relationship quality and depression. However, the effect sizes for these predictors were small, suggesting that despite showing statistical significance, these associations may not be clinically meaningful.¹⁴ Other aspects which we did not take into account, like personality or coping, may explain better how caregiving is related to (neuro)psychological functioning in informal caregivers.

PART II Exploring opportunities to improve the caregivers' lives

The results presented in *Chapter 4* demonstrated that for caregivers, there was a negative quadratic (inverted u-shape) relationship between depression and cognitive empathy and a positive linear relationship between anxiety and affective empathy, irrespective of sociodemographic characteristics. Caregiver burden was not significantly associated with neither cognitive nor affective empathy. For non-caregivers, the relationships between empathy and depression and anxiety were different: we found positive quadratic (u-shape) relationships between cognitive empathy and depression, and between affective empathy and anxiety and depression. We found that caregivers and non-caregivers have the same amount of both cognitive and affective empathy. However no causal inferences can be made due to the cross-sectional nature of the design, we hypothesized that interventions could aim to heighten cognitive empathy and/or to lower affective empathy to diminish caregiver depression and anxiety symptoms.

In *Chapter 5*, the protocol for an investigation into the effectiveness of the mixed virtual reality simulator training Into Dementia was presented. This training was developed in 2010 with the goal to allow caregivers to experience what it is like to live with dementia.⁵ The training's primary aim was to increase empathy and understanding for people with dementia, to ultimately decrease caregiver burden and improve their well-being. The research protocol presented a quasi-experimental longitudinal design, with measurements one week before,

one week after, 2.5 months after, and 15 months after the intervention. Two groups took part; an intervention group and a control group, which were recruited consecutively.

In *Chapter 6*, the effectiveness of the Into Dementia training was evaluated over a period of 15 months, on several outcome measures including cognitive and affective empathy, burden, depression, anxiety, relationship quality, and sense of competence, at both group and individual level. While the caregivers indicated during the interview that their understanding of dementia was improved, no significant change was found on the other outcomes assessed via the questionnaires at either group or individual level. Several explanations as to why no change on the questionnaires was found were given; both methodological considerations and intervention related issues. The design could be improved by randomizing the participants into the groups instead of recruiting them consecutively and the outcome measures could be improved by not only using questionnaires, but also objective measures. The caregivers in the intervention group scored relatively low on the questionnaires measuring psychological problems. This may be due to the insensitivity of the questionnaires to detect the problems, or that the caregivers had relatively few problems, and had not much room for improvement. On the other hand, the dementia simulation was the same for every caregiver, while there exist many differences between caregivers, and between persons with dementia. The simulation therefore reflects one possible scenario, but it may not reflect a caregiver's personal situation. Several caregivers noted that the simulation was not applicable to their situation (anymore) because their loved one had progressed into the next stage of dementia, or that they did not recognize the simulated symptoms because their loved one had vascular dementia or frontotemporal dementia while the simulation focused on symptoms of Alzheimer's dementia. We suggest that if the intervention would be tailored to the type and stage of dementia, the intervention would be more successful.

The key finding of *Chapter 7*, the meta-analyses on a wide range of psychosocial and behavioral interventions for informal caregivers, was that overall the interventions yield significant, yet small, effects. These effects are independent of intervention characteristics including the number of sessions, and the mode of delivery (face-to-face or not). Several explanations for the absence of large effects are given, including that caregiving can have an enormous impact on the caregivers' lives, which is not sufficiently eased by psychological interventions. While the existing interventions can help caregivers gain knowledge about dementia, develop skills, or learn how to treat people with dementia, the fact that providing care for someone with dementia often is a 24/7 job remains a major challenge. We therefore argue that future research should explore other options to aid caregivers in their task.

METHODOLOGICAL CONSIDERATIONS AND STRENGTHS OF THE DISSERTATION

A number of limitations must be acknowledged. These can be divided into design-related considerations and potential issues related to study sample characteristics.

Design-related considerations

The findings from this dissertation are based on information from self-report measures, face-to-face interviews, and neuropsychological tests. Data on psychological functioning were obtained from self-report questionnaires. While the questionnaires are widely used in scientific research, validated, easy to use, and cost efficient, they may be sensitive to social desirability and not reflect actual psychological functioning and behaviors, but rather the participant's opinion about their behaviors. For example, we used a questionnaire to measure empathy, which arguably measures a person's opinion about their empathy rather than their behavior itself. In addition, during the interviews, caregivers noted that they changed the way they cared for their loved one with dementia after the Into Dementia intervention, but we did not objectify these statements by for instance behavior monitoring. To overcome these problems in future research, a combination of several measurement methods (e.g. self-report questionnaires, objective empathy tasks, and behavior monitoring) is recommended. However, these more objective methods are also complicated by their own limitations, as they are often time-consuming, expensive, and (can be) more invasive.

Data on caregiving behavior and all (dementia-related) information regarding the person with dementia, were derived from the semi-structured interviews with the caregiver. While the caregivers could give a quick indication about most topics, more specific information was not taken into account. For instance, the weekly hours spent on care was hard to determine for most caregivers, leading to rough estimations. In addition, several caregivers did not know exactly when the person with dementia was diagnosed, and with which subtype of dementia. To overcome (some of) these problems, information regarding dementia could be obtained from medical records in future studies. However, this approach is also not necessarily free from bias or nuisance and will be more time-consuming.

While we included a broad set of psychological and psychosocial measures, we did not assess personality or coping, because we were trying to keep the time investment to a minimum to ensure a large enough sample. However, personality and coping could be protective factors against stress and burden, or mediating factors between caregiving and these adverse consequences.^{15,16} More specifically, the transactional model of stress and coping by Lazarus and Folkman¹⁷ suggested that the appraisal of stress; whether caregiving is viewed as positive or negative, and the ability to cope with negative emotions or stress, may be very important in the eventually experienced (negative) consequences. In addition, one's personality might

play a role in how caregiving is appraised; a review found that caregivers' neuroticism was linked to more burden, while extraversion and agreeableness were associated with less burden.¹⁶ Personality and coping may therefore be important variables in discovering which caregivers experience which consequences, and necessitate further research.

In *Chapter 2* through *4*, cross-sectional data were used, which means that no conclusions can be drawn regarding causality. In *Chapter 2*, we examined whether caregiver self-esteem could be predicted by modifiable and non-modifiable factors. We found that relationship quality was the best predictor. When giving recommendations for future research, we assumed that enhancing the relationship quality with the person with dementia, could lead to higher self-esteem. However, it could also be that heightening self-esteem would lead to a better relationship quality, and not the other way around. Before drawing conclusions about the direction, longitudinal (experimental) research should be undertaken. In *Chapter 3*, it was found that caregivers have better cognitive functioning than non-caregivers, when controlling for their age, educational level, and sex. We assumed that this would be due to their caregiving responsibilities. However, it is also possible that people who have better cognition pre-caregiving, become (and remain) caregivers, and that people who have worse cognition pre-caregiving less often become caregivers as suggested by the healthy caregiver hypothesis.¹⁸ To examine this, a longitudinal study, comprising a large sample of people who are not yet caregivers, has to be undertaken to examine whether cognition (pre-caregiving) differs between people who later become caregivers, and people who do not become caregivers. This was however beyond the scope of the current study. The same goes for *Chapter 4*; based on our data, no conclusions can be drawn regarding why the relationships between empathy, and depression and anxiety were different for caregivers compared to non-caregivers.

We included informal caregivers at a random moment in time after the diagnosis of a loved one with dementia, because of practical issues. However, the Into D'mentia intervention described and evaluated in *Chapter 5* and *6* respectively, was aimed at caregivers who care for a person with newly-diagnosed (especially Alzheimer's) dementia. Some caregivers noted that the simulation did not resemble the dementia of their loved one anymore, because they had progressed to a later stage. This problem would not have existed if we had recruited caregivers of a person with newly-diagnosed Alzheimer's dementia.

For the intervention study in *Chapter 6*, we did not randomize the caregivers, but instead consecutively recruited the groups. This was due to practical (financial) reasons: the Into D'mentia simulator was available for free for five weeks only, in which we deemed it impossible to include enough caregivers for both groups. The intervention group ($n = 145$) was recruited and tested during a single month, while the recruitment of the control group ($n = 56$) lasted approximately two years. These differences can stem from recruitment differences (taking

part in a simulator may be more appealing than sharing experiences), and from the fact that caregiver research has gained in popularity in the past couple years. While recruiting the control group, many caregivers indicated that they had already participated in other studies and were as such not eligible or willing to participate in our study anymore. In addition, many case managers and facilities for caregivers were reluctant to ask caregivers to participate in our study by the time the recruitment of the control group started, because they felt they overburdened their clients too much by asking.

Potential issues related to study sample characteristics

In the intervention study in *Chapter 6*, the control group experienced more psychological problems than the intervention group. This may have resulted from the fact that the recruitment information given to the groups was different: the intervention group was asked if they wanted to take part in the Into D'mentia simulator, while the control group was asked whether they wanted to share their caregiving experiences. The intervention could have attracted the more active, eager to learn caregiver, while the control group may have attracted caregivers who wanted or needed to share their problems. In addition, because we recruited the groups consecutively, cohort differences may have arisen.

While the control group had on average more depression and anxiety problems than the intervention group, most caregivers in the control group still scored in the normal range, indicating few depression and anxiety problems. In fact, overall, the caregivers in our sample had fewer psychological problems than often reported in scientific studies.^{2,19,20} This may have had several implications. It can (partly) explain why no change on the questionnaires was found after the Into D'mentia intervention in *Chapter 6* in the intervention group; there may have been floor effects on the questionnaires. In *Chapter 3*, only the intervention group took part because only they completed the neuropsychological tasks. As a result, *Chapter 3* is based on a sample with even fewer psychological problems as indicated by the questionnaires, and the conclusions are not generalizable to the overburdened caregivers. It is likely that caregivers who have more burden, depression and/or anxiety symptoms, perform differently on cognitive tasks than caregivers who experience fewer psychological problems. This could however not be tested because only one caregiver scored in the range of 'severe depression symptoms'. In addition, the small range of scores on the questionnaires assessing psychological questionnaires, may have caused problems with the prediction models in *Chapter 2, 3, and 4*: it could have lessened the associations and lowered the statistical power to detect the hypothesized associations.²¹ A possible explanation for the difference in prevalence of psychological problems between our sample and other studies' samples, is the fact that many of our caregivers had some sort of normal care. This normal care oftentimes included having access to a case manager, who helped them with all kinds of administrative and practical issues, but can also offer emotional support. Some caregivers

attended monthly meetings from Alzheimer Nederland, and some were very active in the community regarding informal dementia care. In addition, we recruited the caregivers by a variety of ways including via (social) media instead of only via dementia services. This could have led to a more active, less burdened sample.^{3,22}

As shown in the meta-analyses in *Chapter 7*, intervention studies with informal caregivers usually yield small effects. However, the intervention study in *Chapter 6* may have been underpowered to detect such small effect sizes. Ideally we should have included more caregivers, but this was unfeasible given the time span of the study.

Our sample of caregivers only included Caucasian caregivers. As a result, it is impossible to generalize the results to other ethnic groups. Future research could try to involve caregivers from various ethnic groups, since culture may play a role in attitudes to caregiving.²³⁻²⁵ On the other hand, our sample was quite heterogeneous in terms of other sociodemographics such as age, educational level, type of relationship with the care receiver, and dementia-related characteristics like time spent on caregiving responsibilities, and time since dementia diagnosis of the person with dementia. While a more homogeneous group allows for stronger conclusions,²⁶ our findings are more generalizable to the overall caregiver population. In addition, we tried to explain some of the heterogeneity in several Chapters. In *Chapter 2*, we examined if sociodemographic and psychological variables predicted cognitive functioning, and in *Chapter 3* we examined whether sociodemographic variables predicted caregiver self-esteem. However, we found that cognitive performance and self-esteem, were (largely) independent of sociodemographic characteristics like age, sex, and education, but also of hours spent on care. In *Chapter 4*, we controlled for sociodemographic differences by including these in the first step in our regression analyses. In *Chapter 5*, we detailed that we aimed to build prediction models for intervention effects, to take the heterogeneity of the group into account. However, the simulation of the Into Dementia intervention is not person-centered; it is the same for every caregiver. This may be one reason why the intervention did not have the expected effects, as detailed in *Chapter 6*. In *Chapter 6*, the intervention and control group differed on various sociodemographic variables. For the group analyses, we included these variables as covariates in an attempt to control for these differences. In addition, we executed individual analyses, but no change was found on the quantitative variables. As a result, we decided to drop the prediction models. In the meta-analyses in *Chapter 7*, we found heterogeneity among intervention effects. We aimed to explain this heterogeneity employing meta-regressions using intervention characteristics such as the duration of the intervention, and the intervention type. However, we did not examine whether population (caregiver) characteristics could explain the heterogeneity in intervention effects because this was beyond the scope of the study.

Strengths of this dissertation

Despite these methodological considerations and limitations, the studies presented in this dissertation were valuable because of several strengths. We took a wide range of variables into account, a relatively large sample of informal caregivers was included, and a non-caregiver control group was added to allow for baseline comparisons between these groups. Appropriate statistical models were used in the longitudinal study, which allowed for the inclusion of all data instead of only the data for the participants who completed all measurements, and a comprehensive meta-analysis was conducted to summarize all relevant intervention studies in the field.

IMPLICATIONS AND FUTURE DIRECTIONS

Towards a more comprehensive view of the caregiving situation

Heterogeneity in consequences of caregiving

Previous research indicated that caregivers are likely to experience a multitude of negative consequences due to caregiving.²⁴ These negative consequences are detrimental to the quality of life for both caregivers and patients, and can also lead to the institutionalization of the person with dementia, because the caregiver can no longer provide high quality care.²⁷ However, while recruiting and conducting the interviews with the caregivers, many caregivers pointed out that they (also) experienced positive consequences like satisfaction with the caregiver role. The caregivers noted that these positive experiences are at least equally important because it gives them meaning in life, and focusing on these can lead to a more affirmative experience overall.

In this dissertation we explored one of the positive consequences in *Chapter 2*: self-esteem. We found that the positive consequence heightened self-esteem is not merely the opposite of the negative consequences. In fact, the aspects of caregiver burden were not (significantly) associated with self-esteem, and depression and self-esteem showed only a small correlation. This suggests that these positive and negative consequences can co-exist within the same caregiver. In addition, we learned that caregivers performed better than, or similar to non-caregivers on memory and executive functioning tasks, and that this was largely independent of sociodemographic and psychological characteristics (*Chapter 3*). This enhanced cognitive functioning can be seen as another positive consequence (some) caregivers may experience. We propose that there are both positive and negative consequences due to caregiving, which can contribute to how caregiving is experienced. Hence, caregiving is not only linked to adverse outcomes, as often proposed in the caregiving literature. We argue that both need to be addressed in research, policy, and clinical practice with caregivers, in order to fully comprehend the complex caregiving experience.

Heterogeneity in caregiver characteristics

Since the caregiver population is very heterogeneous in terms of both sociodemographic characteristics, and experienced consequences, previous research has tried to identify sociodemographic predictors for the negative consequences of caregiving. Several sociodemographic predictors for the negative consequences of caregiving have been identified: female gender,^{2,28} being a spousal caregiver,²⁸⁻³⁰ having low level of education,³¹ cohabitation with the person with dementia,³¹ and providing a higher amount of informal care.^{28,32} However, often contradictory results have been found and not all predictors have been replicated.

We tried to identify sociodemographic characteristics for self-esteem and cognitive performance. If these would be known, it could be examined what distinguishes the caregivers who do and do not experience positive/negative consequences, and caregivers could be selected for targeted interventions. However, no sociodemographic predictors were found in **PART I**. Even dementia-related variables, such as if the caregiver and the person with dementia lived together, or the amount of hours caregivers spent on caregiving were not (significantly) associated with either self-esteem or cognition. Which caregivers do experience positive or negative consequences and why remains to be elucidated.

How to best care for the caregivers? A person-centered approach

Evidently, because caregivers may experience negative consequences of caregiving, interventions to diminish these consequences are needed. In the past decade, many interventions have been developed, which show only small effects (*Chapter 7*).

We think that it is likely that a complex interplay of a multitude of variables plays a role in predicting which caregiver experiences which consequences. In addition, since the results of prediction models for negative and positive consequences are often contradictory, and because caregivers likely differ on a multitude of other characteristics, we propose that selecting caregivers for interventions based on sociodemographic characteristics, or simply developing more psychological interventions for caregivers may not be the best way forward. As proposed in **PART II, Chapter 6**, one of the explanations for absence of change on questionnaires after the Into D'mentia simulation was that the intervention was not person-centered: the simulator was the same for every caregiver. In addition, we learned from *Chapter 7* that other intervention-related characteristics like the number of sessions are also not related to the effectiveness: the existing interventions seem to yield small effects irrespective of such characteristics.

Taken the results from **PART I** and **PART II** together, we argue that we need to take a step back in caregiving research. We hypothesize that a shift has to be established from a one-

intervention-fits-most perspective, to personalized care to ultimately aid the caregivers in their task. Ideally the case manager, who provides standard care in the Netherlands, could tune in with the caregiver every month to monitor both the caregiver and person with dementia to identify minor problems, before these escalate. A short semi-structured interview could help to address the most common problems. They should examine together if, and what kind of help, the caregiver needs. (Parts of) the existing psychological interventions could provide a basis for the case manager and the caregiver to choose from. On the other hand, (parts of the) existing interventions could be made standard care provided by the municipalities, to prevent the problems from arising. We argue that informal caregivers should however be involved in every step forward, and in designing interventions or standard care, because they can point out best what they really need.

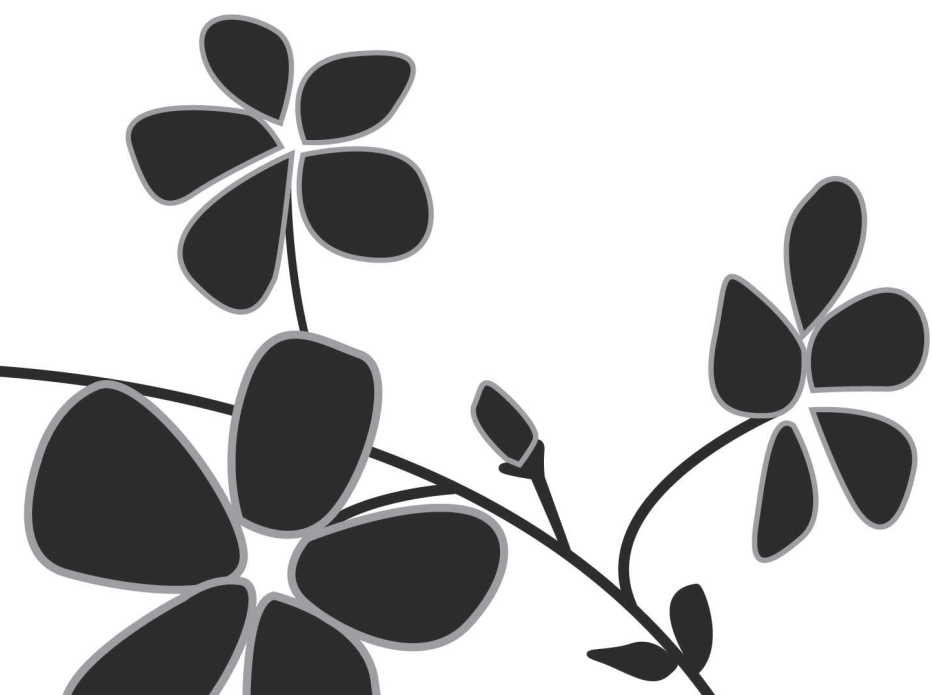
CONCLUSIONS

With this dissertation we gained more insight in the current (neuro)psychological situation of informal dementia caregivers. We shed light on one of the often overlooked positive consequences; heightened self-esteem. In addition, we found that caregivers can have better memory functioning. We argue that it is of major importance to highlight both the positive and negative consequences of caregiving in policy, clinical practice, and research. In addition, we found that there are many psychological interventions for caregivers aiming to enhance their well-being. While some of these show statistical effectiveness, these effects are small and caregivers may need more in order to be really helped in their caregiving role. We think that continuous, person-centered care, is needed to enhance the lives of both caregiver and person with dementia.

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APPENDIX

NEDERLANDSE SAMENVATTING (DUTCH SUMMARY)

DANKWOORD (ACKNOWLEDGMENTS IN DUTCH)

LIST OF PUBLICATIONS

ABOUT THE AUTHOR

NEDERLANDSE SAMENVATTING (DUTCH SUMMARY)

INLEIDING

Dementie

Dementie wordt gekenmerkt door een achteruitgang in het cognitief functioneren in een of meerdere domeinen, welke interfereren met het dagelijks leven en de onafhankelijkheid van de persoon met dementie.¹ De cognitieve domeinen die aangedaan kunnen zijn, zijn onder andere geheugen, aandacht, executief functioneren, taal, perceptie, en motorische functies. Alhoewel cognitieve achteruitgang het voornaamste kenmerk van dementie is, komen (neuro)psychiatrische problemen, zoals agitatie, depressie, en hallucinaties ook veel voor en kunnen bij aanvang van de ziekte zelfs meer op de voorgrond staan dan de cognitieve problemen.²

Wereldwijd hebben meer dan 46.8 miljoen mensen dementie. Dit aantal zal iedere 20 jaar bijna verdubbelen, tot ongeveer 74.7 miljoen in 2030, en 131.5 miljoen in 2050. Deze toename kan worden verklaard door populatiegroei en vergrijzing.³ Alhoewel dementie vaker voorkomt onder ouderen, is het geen onderdeel van normaal ouder worden: de cognitieve achteruitgang is anders en heviger dan verklaard kan worden door veroudering alleen.^{4,5} Daarnaast zijn er grote verschillen in de morfologische veranderingen in het brein van mensen met dementie, vergeleken met het brein van mensen die gezond ouder worden.⁶

Dementie is een overkoepelende term voor veel verschillende subtypen, waarvan de ziekte van Alzheimer en vasculaire dementie de meest voorkomende zijn. Dementiesubtypen verschillen in etiologie, de aangedane cognitieve vaardigheden, bijkomende psychiatrische of gedragsmatige symptomen, en andere klinische eigenschappen. In het begin is het vaak mogelijk onderscheid te maken tussen de verschillende subtypen, in de verder gevorderde stadia vertonen deze veel gelijkenissen door de toename en hevigere intensiteit van symptomen.

De symptomen van dementie beginnen normaliter mild, waarbij iemands cognitief functioneren in milde mate is aangedaan, en kunnen na verloop van tijd zeer ernstig worden, waarbij de aangedane persoon geheel afhankelijk is van anderen voor het dagelijks functioneren.⁷ Veel mensen met ver gevorderde dementie zijn opgenomen in een verzorgingsinstelling, terwijl de meeste mensen met beginnende dementie thuis wonen, waar mantelzorgers hen ondersteunen bij dagelijkse zaken.

Mantelzorg

Mantelzorgers zijn doorgaans partners, dochters, of andere familieleden of vrienden van de persoon met dementie. Zij verlenen (onbetaald) de grootste hoeveelheid van de zorg voor hun naasten met dementie. Deze zorg bestaat bijvoorbeeld uit het begeleiden bij activiteiten in het dagelijks leven, medische ondersteuning (medicatie geven, het plannen en begeleiden van de naaste naar het ziekenhuis, of het nemen van besluiten aangaande de behandeling), maar ook supervisie, en het bieden van steun.⁸ In Nederland wordt iemand als mantelzorger beschouwd indien degene ten minste acht uur per week besteedt aan het verlenen van onbetaalde zorgtaken, voor meer dan drie maanden, voor een familielid of vriend met dementie. Mantelzorgers zijn als groep zeer heterogeen; zij verschillen bijvoorbeeld in geslacht, leeftijd, de relatie die zij hebben met de persoon met dementie (bijvoorbeeld partner of kind), of zij samenwonen met de persoon met dementie, hoeveel uur zij besteden aan de zorgtaken, en welke zorgtaken zij uitvoeren. Het is belangrijk rekening te houden met deze heterogeniteit bij het generaliseren van resultaten van wetenschappelijk onderzoek.

Negatieve gevolgen van mantelzorgen

Mantelzorgen wordt vaak gezien als een lastige taak. Mantelzorgers hebben vaak meer last van depressie,⁹ angstklachten,^{9,10} en stress,¹⁰ ze ervaren vaak een lager gevoel van welzijn,¹⁰ en zij functioneren fysiek vaak slechter¹¹ dan mensen die geen mantelzorg verlenen. Daarnaast kunnen zij 'zorglast' ervaren, wat gedefinieerd kan worden als 'de mate waarin het emotionele of fysieke welzijn, het sociale leven, of de financiële situatie van de mantelzorger lijdt als consequentie van het zorgen voor de naaste'.¹² Mantelzorgers voor mensen met dementie hebben meer last van deze zogeheten negatieve consequenties dan mantelzorgers die zorgen voor naasten met andere ziektebeelden.¹³ In Nederland ervaart 54% van de mantelzorgers voor mensen met dementie een zekere vorm van zorglast, en 16% ervaart een zeer hoge mate van zorglast, of is zelfs overbelast door het mantelzorgen.¹⁴ Het is belangrijk deze negatieve consequenties te verminderen, allereerst omdat deze schadelijk zijn voor het welzijn van mantelzorgers, maar ook omdat overbelasting van de mantelzorger de voornaamste reden is voor institutionalisering van de naaste met dementie.¹⁵

Niet iedere mantelzorger ervaart echter dezelfde negatieve consequenties, en zeker niet in dezelfde mate. Voorgaand onderzoek heeft bijvoorbeeld aangetoond dat het vrouwelijk geslacht,^{9,13} het zijn van een partner van de persoon met dementie,^{13,16,17} en een lager opleidingsniveau¹⁸ risicofactoren zijn voor het ervaren van bepaalde negatieve uitkomsten. Daarnaast lijken het samenwonen met de persoon met dementie, het verlenen van meerdere zorgtaken, en een langer ziekteproces geassocieerd te zijn met het ervaren van (meer) negatieve consequenties.^{13,18}

Positieve gevolgen van mantelzorgen

Aan de andere kant kunnen mantelzorgers ook positieve consequenties van mantelzorg ervaren, wat steeds meer benadrukt wordt in de wetenschappelijke literatuur. Deze positieve consequenties zijn meer dan enkel het tegenovergestelde van zorglast; mantelzorgers kunnen tegelijkertijd positieve en negatieve consequenties ervaren.¹⁹ Deze positieve gevolgen zijn bijvoorbeeld tevredenheid met de rol van mantelzorger, en het gevoel van nodig zijn of gewaardeerd worden. Er is echter nog geen geaccepteerde definitie voor deze gevolgen zoals deze voor zorglast bestaat,²⁰ wat zorgt voor vele verschillende operationalisaties in wetenschappelijke studies. Meer onderzoek naar deze positieve gevolgen is nodig omdat deze de negatieve gevolgen kunnen verminderen,^{21,22} en daarmee wellicht ook de opname van de persoon met dementie in een verzorgingsinstelling kunnen vertragen.^{23,24} Daarnaast is het belangrijk om ook aandacht te schenken aan de positieve kant om een completer beeld te krijgen van mantelzorg.²⁵

Een ander aspect om te belichten zijn de cognitieve vaardigheden van mantelzorgers. Voorgaande onderzoeken hebben laten zien dat mantelzorgers verminderde cognitieve capaciteiten hebben, vergeleken met mensen die geen mantelzorg verlenen.²⁶⁻³¹ Anderen vinden dat mantelzorgers juist beter presteren op cognitieve taken.³² Deze verschillende bevindingen kunnen te wijten zijn aan methodologische tekortkomingen van eerder onderzoek, zoals te kleine steekproeven, het niet meewegen van covariaten zoals leeftijd of opleidingsniveau, en door bijvoorbeeld selectiebias. Meer onderzoek is nodig, omdat slechtere cognitieve vaardigheden een enorme impact kunnen hebben op het leven van de mantelzorger, de kwaliteit van de mantelzorg, en de woonsituatie van de persoon met dementie.

Interventies voor mantelzorgers

Er zijn veel interventies voor mantelzorgers ontworpen om de negatieve consequenties te verminderen, zoals (theoretische) cursussen, steungroepen, of counseling.³³ Geen van de onderzochte interventies heeft echter geprobeerd om empathie te verhogen door middel van ervaringsleren, om vervolgens zorglast te verminderen. Een hogere mate van empathie onder zorgprofessionals is echter geassocieerd met betere uitkomsten voor de professionals als voor hun patiënten.³⁴⁻³⁶ Daarom zijn er interventies voor professionals ontwikkeld, welke empathie trachten te verhogen om professionele zorg te optimaliseren. Voor mantelzorgers is de link tussen empathie en de negatieve consequenties van mantelzorg onderzocht in slechts enkele studies,^{37,38} welke gemengde resultaten opleverden. Meer onderzoek is nodig om te weten te komen of het verhogen van empathie onder mantelzorgers ook zou kunnen leiden tot betere uitkomsten voor mantelzorgers. Ervaringsleren is leren door doen of ervaren, en kan worden bereikt door virtual of augmented reality.³⁹ Simulatietraining

om empathie te verhogen is effectief gebleken onder geneeskundestudenten,⁴⁰ maar is nog niet onderzocht in experimentele onderzoeken met mantelzorgers. In 2010 is Into D'mentia, een mixed virtual reality simulatie interventie,⁴¹ ontwikkeld waarin mantelzorgers beleven deze hoe het is om dementie te hebben. Onderzoek is nodig om te weten te komen of deze interventie in staat is empathie en begrip voor mensen met dementie te verhogen en negatieve consequenties zoals zorglast te verminderen.

Ten slotte zijn er vele systematische literatuurreviews welke de effectiviteit van psychologische interventies voor mantelzorgers op allerlei uitkomstmaten onderzoeken. Deze zijn echter zeer gelimiteerd in omvang: sommige richten zich op slechts een type interventie,⁴²⁻⁴⁴ of op een specifieke subgroep zoals mantelzorgers die samenwonen met de persoon met dementie.⁴⁵ Omdat er geen compleet overzicht van interventies is, blijft het voor nu onduidelijk hoe effectief deze interventies zijn als geheel, en relatief ten opzichte van elkaar.

DOEL VAN DIT PROEFSCHRIFT

Het doel van dit proefschrift was tweeledig. In **DEEL I** wilden we meer inzicht krijgen in een van de positieve consequenties van mantelzorgen: verhoogde eigenwaarde. Daarnaast beoogden we te weten te komen of mantelzorgers beter, hetzelfde, of slechter presteren op cognitieve taken vergeleken met mensen die geen mantelzorg verlenen. In **DEEL II** hebben we mogelijkheden verkend om de negatieve consequenties van mantelzorgen te verlichten, teneinde het welzijn van de mantelzorger te verbeteren.

Dit proefschrift is gebaseerd op data verzameld voor de Into D'mentia studie, een quasi-experimentele, longitudinale studie in Nederland. Voor deze studie werden participanten geïnccludeerd voor drie groepen: een interventiegroep en twee controlegroepen. De interventiegroep ($n = 145$) en de eerste controlegroep ($n = 56$) bestonden uit mantelzorgers (18+), die ten minste acht uur per dag besteedden aan de zorg voor een thuiswonende naaste met dementie. Mantelzorgers wiens naaste werd opgenomen of overleed tijdens de loop van het onderzoek, werden beschouwd als drop-out. Data werden verzameld op baseline (voorafgaand aan de interventie), een week, 2,5 maand, en 15 maanden na de Into D'mentia interventie. De tweede controlegroep werd eenmaal getest, om vergelijkingen op baseline mogelijk te maken. Deze controlegroep bestond uit $n = 187$ volwassenen die geen mantelzorg verleenden, en gelijk waren aan de mantelzorgers wat betreft leeftijd, geslacht, en opleidingsniveau. Op ieder meetmoment werd een interview afgenomen, en vulden de participanten een vragenlijstboekje in. Op baseline werden er bij de interventiegroep en de controlegroep bovendien een aantal neuropsychologische testen afgenomen om inzicht te krijgen in hun cognitieve capaciteiten.

Hoofdstuk 2, 3, en 4 zijn gebaseerd op baseline data, en *Hoofdstuk 6* is gebaseerd op alle meetmomenten. Voor *Hoofdstuk 2* en *4* zijn de interventiegroep en de eerste controlegroep samengevoegd, tot een grote groep mantelzorgers. Voor *Hoofdstuk 3* zijn alleen de interventiegroep en de tweede controlegroep gebruikt omdat alleen zij de neuropsychologische taken volbrachten. De data van de tweede controlegroep (niet-mantelzorgers) zijn gebruikt voor *Hoofdstuk 3* en *4*. *Hoofdstuk 7* presenteert een meta-analyse, gebaseerd op data van andere, gepubliceerde, interventiestudies.

VOORNAAMSTE BEVINDINGEN VAN DIT PROEFSCHRIFT

DEEL I Positieve aspecten van de (neuro)psychologische situatie waarin mantelzorgers voor mensen met dementie zich bevinden

Hoofdstuk 2 ging over een van de vaak over het hoofd geziene positieve consequenties van mantelzorg: verhoogde eigenwaarde. Eigenwaarde is de mate waarin iemand zichzelf waardeert en accepteert.⁴⁶ Daar eigenwaarde voorspellend is voor succes en welzijn,⁴⁷ en het gegeven dat mantelzorgen de manier waarop mantelzorgers zichzelf waarderen kan beïnvloeden,⁴⁸ is het belangrijk hier meer aandacht aan te schenken. Wij onderzochten of er modificeerbare factoren zijn die eigenwaarde voorspellen, wanneer niet-modificeerbare factoren constant worden gehouden. Onderscheid maken tussen modificeerbare en niet-modificeerbare voorspellers is belangrijk vanuit een klinisch interventie perspectief, omdat interventies kunnen inzetten op modificeerbare factoren. Niet-modificeerbare factoren kunnen niet worden veranderd door interventies, maar kunnen wel worden ingezet om mantelzorgers te identificeren die meer (of minder) eigenwaarde bezitten.⁴⁹ Wij vonden dat geen van de niet-modificeerbare factoren (leeftijd, geslacht, opleidingsniveau, de relatie met de persoon met dementie, het aantal uren dat werd besteed aan mantelzorgen per week, en de verstreken tijd sinds diagnose), voorspellend was voor eigenwaarde in het eerste blok van een hiërarchische multivariabele regressieanalyse. Een betere relatiekwaliteit met de persoon met dementie, en minder depressieve symptomen waren wel voorspellend voor eigenwaarde, ook na het constant houden van de bovengenoemde sociodemografische factoren. Wij denken dat een meer omvattende definitie voor de positieve consequenties nodig is, waarvan eigenwaarde enkel een aspect is. Daarnaast zou een vragenlijst, welke meerdere positieve aspecten meet, behulpzaam zijn om resultaten van verschillende onderzoeken te vergelijken en de replicerbaarheid van deze resultaten te vergroten. Het is namelijk aannemelijk dat verschillende aspecten verschillende voorspellers hebben, zoals dat ook voor de negatieve consequenties geldt.

In *Hoofdstuk 3* hebben we onderzocht of mantelzorgers slechter, hetzelfde, of beter presteren op neuropsychologische testen voor episodisch geheugen en executief functioneren. Wij vonden dat mantelzorgers beter presteren op een taak voor episodisch geheugen

dan mensen die niet mantelzorgen, wanneer wij rekening houden met leeftijd, geslacht, en opleidingsniveau in de analyses. De prestaties op taken voor executief functioneren verschilden niet tussen mantelzorgers en niet-mantelzorgers. Enkel het mannelijk geslacht en hogere scores op sociale betrokkenheid voorspelden hogere scores op *Category Fluency* (categoriale woordvlotheid), een taak voor executief functioneren. Psychologische symptomen of problemen, zoals zorglast, depressie, en angst waren niet voorspellend voor cognitieve testcores. Deze resultaten weerspreken voorgaand onderzoek dat stelde dat de cognitieve vaardigheden van mantelzorgers verminderd zijn door de negatieve consequenties van mantelzorgen zoals stress, zorglast, en depressie.^{26,28-31,50} Dit zou kunnen komen doordat de mantelzorgers in onze steekproef minder zorglast, depressie, en angstproblemen ervoeren dan mantelzorgers in voorgaande studies. Wellicht presteren overbelaste mantelzorgers slechter op cognitieve taken, maar geldt dit niet voor de niet-overbelaste mantelzorgers. Dit konden wij niet onderzoeken, omdat het scorebereik op de vragenlijsten voor zorglast, depressie, en angst te smal was.⁵¹ Toekomstig onderzoek zal dit moeten uitwijzen.

Opmerkelijk was dat noch eigenwaarde, noch cognitie (systematisch) voorspeld werd door sociodemografische karakteristieken van mantelzorgers, of dementie-gerelateerde factoren in de multivariabele regressieanalyses. Bij de factoren die wel voorspellend werden bevonden, waren de effectgroottes klein, wat doet vermoeden dat deze associaties in de klinische praktijk minder belangrijk zijn ondanks statistische significantie.⁵² Andere aspecten, welke wij niet mee hebben genomen, zoals persoonlijkheid of coping (hoe iemand omgaat met problemen of stresssituaties), kunnen mogelijk beter verklaren hoe mantelzorgen geassocieerd is met het (neuro)psychologisch functioneren van mantelzorgers.

DEEL II Het verkennen van mogelijkheden om de levens van mantelzorgers te verbeteren

In *Hoofdstuk 4* hebben wij onderzocht of er verbanden bestaan tussen empathie (cognitief en affectief) enerzijds, en depressie, angst, en zorglast anderzijds. Indien dit net als bij zorgprofessionals het geval zou zijn, zouden interventies kunnen proberen empathie te verhogen, om de negatieve consequenties te verminderen. Aangezien het aannemelijk is dat zowel teveel, als te weinig, empathie nadelig kunnen zijn, hebben wij onderzocht of de verbanden (indien aanwezig) lineair of kwadratisch zijn. De resultaten lieten zien dat er voor mantelzorgers een kwadratisch verband (omgekeerde u-vorm) bestaat tussen depressie en cognitieve empathie en een positief lineair verband tussen angst en affectieve empathie. Zorglast was niet geassocieerd met cognitieve of affectieve empathie. Voor niet-mantelzorgers vonden wij positieve kwadratische verbanden (u-vorm) tussen cognitieve empathie en depressie, en tussen affectieve empathie en zowel angst als depressie. Voorts hadden mantelzorgers en niet-mantelzorgers hetzelfde niveau van zowel cognitieve als affectieve empathie. Alhoewel er geen causale conclusies mogen worden getrokken door het

cross-sectionele design van de studie, veronderstellen wij dat interventies voor mantelzorgers cognitieve empathie zouden kunnen proberen te verhogen teneinde depressieve klachten te verminderen.

Hoofdstuk 5 presenteerde het protocol voor een effectiviteitsstudie naar de effecten van de mixed virtual reality simulator Into D'mentia. Deze training is ontworpen in 2010 met het doel mantelzorgers te laten ervaren hoe het is om met dementie te leven.⁴¹ Het voornaamste doel van de training was het verhogen van (cognitieve) empathie en begrip voor (mensen met) dementie, teneinde zorglast te verminderen en het welzijn van mantelzorgers te verbeteren. Het protocol behelsde een quasi-experimenteel longitudinaal design met meetmomenten een week voorafgaand, een week na, 2,5 maand na, en 15 maanden na de interventie. Zodoende werden effecten zowel op korte als lange termijn gemeten. Omdat het aannemelijk is dat de interventie niet hetzelfde effect heeft op iedere mantelzorgers, beschreef het protocol analyses op zowel groeps- als individueel niveau. Twee groepen namen deel: een interventie- en een controlegroep, welke achtereenvolgens werden geworven.

In *Hoofdstuk 6* is de effectiviteit van de Into D'mentia interventie geëvalueerd over een periode van 15 maanden, op diverse uitkomstmaten waaronder cognitieve en affectieve empathie, zorglast, depressie, angst, relatiekwaliteit met de persoon met dementie, en ervaren gevoel van competentie, op zowel groeps- als individueel niveau. Alhoewel de mantelzorgers tijdens het interview aangaven dat hun begrip voor dementie was verhoogd, werd er geen significante verandering gevonden op de uitkomstmaten gemeten met de vragenlijsten. Het uitblijven van verandering op de vragenlijsten kan op meerdere manieren worden verklaard; zowel door methodologische overwegingen als problemen gerelateerd aan de interventie. Het design zou verbeterd kunnen worden door de participanten te randomiseren over de groepen in plaats van de groepen consecutief te werven, en men zou objectieve meetinstrumenten kunnen gebruiken om de uitkomsten te meten in plaats van (enkel) vragenlijsten. Voorts hadden de mantelzorgers relatief lage scores op de vragenlijsten voor psychologische problemen. Dit kan verklaard worden doordat de vragenlijsten niet sensitief genoeg waren om de problemen te detecteren, ofwel doordat de mantelzorgers relatief weinig problemen hadden. Dit laatste zou betekenen dat de mantelzorgers weinig ruimte voor verbetering hadden, wat het uitblijven van verandering kan verklaren. Anderzijds was de interventie hetzelfde voor iedere mantelzorgers, terwijl er veel verschillen tussen mantelzorgers bestaan. Meerdere mantelzorgers gaven tijdens de interviews aan dat het gesimuleerde scenario hun situatie niet (meer) accuraat weerspiegelde, omdat de dementie van hun naaste bijvoorbeeld verder gevorderd was dan gesimuleerd werd. Daarnaast werden vooral symptomen behorend bij de ziekte van Alzheimer gesimuleerd, terwijl er ook mantelzorgers participeerden wiens naaste vasculaire of fronto-temporale dementie had. Het gesimuleerde was zodoende niet altijd een accurate weergave van iemands persoonlijke

situatie. Toekomstig onderzoek zou de simulatie kunnen personaliseren en onderzoeken of de interventie dan wel effect sorteert op de vragenlijsten en/of objectieve maten.

Hoofdstuk 7 presenteerde een literatuuroverzicht en meta-analyse van 60 individuele, gepubliceerde, interventiestudies voor mantelzorgers. Hiermee beoogden wij te onderzoeken hoe effectief interventies voor mantelzorgers over het geheel genomen zijn. We hebben zodoende de effectgroottes van iedere afzonderlijke interventie, als ook een gemiddeld effect over alle interventies heen berekend. Daarnaast hebben we gekeken of bepaalde interventiekenmerken, zoals hoe lang de interventie duurde, samenhang met grotere effecten. De belangrijkste bevinding van *Hoofdstuk 7* was dat deze interventies over het algemeen significante, maar kleine, effecten sorteren ten aanzien van het verminderen van zorglast, depressie, angst, en stress, en het verhogen van de kwaliteit van leven, en ervaren gevoel van competentie onder mantelzorgers. Deze effecten waren onafhankelijk van bepaalde interventiekenmerken zoals het aantal sessies, en of de interventie face-to-face werd gegeven (of bijvoorbeeld telefonisch of via internet). Wij denken dat verschillende zaken het uitblijven van grote effecten kunnen verklaren. Mantelzorgen kan bijvoorbeeld een enorme impact hebben op het leven van mantelzorgers, welke niet voldoende kan worden verlicht door psychologische interventies. De bestaande interventies kunnen mantelzorgers wel meer kennis over dementie geven, of vaardigheden aanleren om beter met mensen met dementie om te leren gaan. Echter blijft het feit dat mantelzorgen soms ervaren wordt als een fulltime baan, een grote uitdaging voor velen. Daarom denken wij dat toekomstig onderzoek andere opties zou moeten verkennen om de zorgtaken van mantelzorgers te verlichten.

IMPLICATIES EN AANBEVELINGEN VOOR VERVOLGONDERZOEK

Heterogeniteit in de consequenties van mantelzorgen en mantelzorgkenmerken

In dit proefschrift is aandacht besteed aan een van de positieve consequenties van mantelzorg: verhoogde eigenwaarde. Daarnaast hebben wij gevonden dat mantelzorgers beter presteerden op een taak voor episodisch geheugen, wat gezien kan worden als een andere positieve consequentie die (sommige) mantelzorgers kunnen ervaren. Het is aannemelijk dat sommige mantelzorgers vooral negatieve consequenties ervaren, terwijl anderen vooral positieve gevolgen ervaren, en dat weer andere mantelzorgers beide ervaren. Dit kan natuurlijk per moment verschillen. Wij hebben geprobeerd met mantelzorgkenmerken te voorspellen welke mantelzorger welke consequenties ervaart. Als voorspellers geïdentificeerd zouden kunnen worden, zou het bijvoorbeeld mogelijk zijn om de mantelzorgers die een hoog risico lopen op het ervaren van depressieve symptomen, te selecteren voor een interventie die deze vermindert. Echter hebben wij geen sluitend antwoord gevonden op deze vraag; het blijft voor nu onduidelijk wie wat ervaart of zal ervaren. Toekomstig onderzoek zou kunnen onderzoeken of bepaalde persoonlijkheidstrekken of copingstijlen samenhangen met de ervaren

consequenties, dit hebben wij in het huidige onderzoek niet mee kunnen nemen. Wij pleiten er nu echter voor zowel de positieve als negatieve consequenties aan bod te laten komen in wetenschappelijk onderzoek, in de klinische praktijk met mantelzorgers, en beleidsvorming. Het focussen op beide aspecten is belangrijk om de gehele mantelzorgervaring te begrijpen.

Hoe kunnen we het beste zorgen voor de mantelzorgers?

Een gepersonaliseerde aanpak

Het is duidelijk dat er interventies voor mantelzorgers nodig zijn omdat veel van hen negatieve gevolgen ervaren. In de afgelopen eeuw zijn vele interventies ontwikkeld, welke echter slechts kleine effecten hebben op een aantal van deze negatieve consequenties.

Wij achten het aannemelijk dat een complexe wisselwerking van een grote hoeveelheid factoren er uiteindelijk voor zorgt welke consequenties een bepaalde mantelzorger uiteindelijk, of in de loop van de ziekte, ervaart. Wij denken daarom dat het selecteren van specifieke mantelzorgers voor specifieke interventies, niet zinvol of praktisch is. Voorts denken wij dat het weinig zinvol is om simpelweg meer (psychologische) interventies te blijven ontwikkelen voor mantelzorgers op dezelfde wijze als dat nu gebeurt. In *Hoofdstuk 7* zagen we namelijk dat psychologische interventies overal het algemeen slechts kleine effecten hebben, onafhankelijk van hoe deze interventies zijn opgezet.

Als we de resultaten van **DEEL I** en **DEEL II** samen bekijken, komen wij tot de conclusie dat we een andere weg moeten inslaan om mantelzorgers te helpen. Gezien de grote heterogeniteit in zowel mantelzorgers, personen met dementie, en consequenties die mantelzorgers kunnen ervaren, lijkt het ons het beste om een meer gepersonaliseerde aanpak te hanteren. Idealiter zou de casemanager, die in Nederland de standaardzorg verleent, iedere maand met de mantelzorger moeten kijken hoe het met de mantelzorger en de persoon met dementie gaat. Zodoende zouden kleine problemen aan het licht kunnen komen nog voordat deze escaleren. Een kort semigestructureerd interview zou kunnen helpen om de meest voorkomende problemen door te spreken. De casemanager en mantelzorger zouden samen moeten onderzoeken of, en welke soort hulp de mantelzorger op dat moment, en in de toekomst nodig heeft of verwacht nodig te hebben. (Delen van) bestaande interventies zouden een basis kunnen vormen waaruit de casemanager en mantelzorger kunnen kiezen. Aan de andere kant zouden gemeenten ervoor kunnen kiezen om (delen van) bestaande interventies standaardzorg te maken, om te voorkomen dat bepaalde problemen zich voordoen. Het lijkt ons verstandig om de mantelzorgers te betrekken bij het vormgeven van deze standaardzorg, omdat zij het beste kunnen aangeven wat zij nodig hebben.

CONCLUSIES

In dit proefschrift hebben wij licht geworpen op de huidige (neuro)psychologische situatie van mantelzorgers van mensen met dementie. We hebben een van de vaak over het hoofd geziene positieve consequenties van mantelzorgers belicht: verhoogde eigenwaarde. Daarnaast vonden wij dat mantelzorgers beter kunnen presteren op geheugentaken dan niet-mantelzorgers. Wij denken dat het van groot belang is om zowel de positieve als negatieve consequenties te belichten in beleidsvorming, klinische praktijk, en (wetenschappelijk) onderzoek. Ook vonden wij dat er veel psychologische interventies zijn voor mantelzorgers om hun welzijn te verbeteren. Alhoewel een deel van deze interventies statistisch gezien effectief is, zijn deze effecten klein. Wij denken dat sommige mantelzorgers meer nodig hebben om daadwerkelijk geholpen te zijn in hun zorgverlenende rol. Een continu persoonlijk zorgplan kan nodig zijn om het welzijn van zowel de mantelzorger als de persoon met dementie te kunnen verbeteren.

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