CLINICAL TRIAL

The effects of a salutogenic strength-based intervention on sense of coherence and health outcomes of dementia family carers: A randomized controlled trial

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Abstract

Introduction: Dementia caregiving is associated with notable impacts on the health of family carers. Although sense of coherence (SOC), as a core dimension of inner strength, has been found to have health-protecting effects in stressful encounters, few studies have designed a strength-based intervention to optimise SOC and thereby the health of carers.
Objectives: To identify the effects of a strength-based intervention on SOC, coping, health-related quality of life (HRQoL), perceived burden and depression among Chinese family carers of people with dementia and to examine whether the health effects, if any, are mediated through an enhanced SOC and effective coping.
Design: A double-blind randomised controlled trial comparing a strengths-based intervention with a general education control.
Intervention: A 14-session strengths-based intervention which combined the use of narrative and empowerment strategies to support the carers of people with dementia to optimise the use of their generalised resistance resources in coping with the caregiving situation.
Setting: Older people community centres in Hong Kong.
Results: A total of 350 family carers participated in the study (mean age: 65.0 (SD = 12.3); female: 84.6%). Participants who received the strength-based intervention reported significantly greater improvements in their SOC, mental health, perceived burden and depression, than those in the education group, over a 22-week evaluation period. Path analysis models revealed that an SOC wholly mediated the relationship between the strength-based intervention and mental HRQoL (covering energy/vitality and psychosocial functioning) and partially mediated the relationship between the strength-based intervention and depression. We did not identify any harm from the intervention.
Conclusion: A strength-based intervention is effective in improving the perceived burden and mental health of family caregivers of persons with dementia, and an SOC plays an important role in accounting for the mental health benefits.
Trial registration: The trial was registered in the World Health Organization International Clinical Trials Registry Platform (Main ID: ChiCTR-IIC-17011097).

Key Points

- A strength-based intervention based upon Antonovsky's theory of salutogenesis improves health outcomes of dementia caregivers.
- A sense of coherence mediates the relationship between the strength-based intervention and positive health impacts.
- Dementia caregiver services need a paradigm shift from the conventional deficits- or problem-based approach to a strength-optimisation approach.

Introduction

Dementia affects approximately 55 million people worldwide, and its prevalence is expected to rise, given the ageing of the global population [1]. The family carers of people living with dementia (PwD) carry a substantial burden as dementia is characterised by a spectrum of psychobehavioural symptoms. Extensive literature has identified that carers are at higher risk of chronic stress, depressed mood, cognitive decline and poor physical health than non-carers [2–4]. A variety of non-pharmacological interventions have been developed to support dementia caregiving. A recent review of 131 trials categorised these interventions into eight modalities, including two types of psychoeducation, counselling and psychotherapy, mindfulness-based interventions, support groups, care coordination and case management, training of PwD with carer involvement and multi-component interventions [5]. Although these interventions have consistently improved the psychosocial outcomes for carers, health benefits have not been sustained. The limited scope of such interventions in building the resilience of carers and turning their stressful caregiving encounters into growth opportunities might explain this result. It has been recommended that dementia caregiving research needs to be extended in such a direction, especially when 'time-limited' carer support interventions focusing on enhancing external coping resources do not match persisting dementia caregiving responsibilities.

Recent studies have addressed the importance of inner strength in alleviating burden and maintaining health among family carers of PwDs [6–8]. Of note, sense of coherence (SOC), a core dimension of inner strength [9], has been proposed as being associated with physical and psychological health [10]: e.g. stress-buffering [11], reduced emotional distress [12], successful coping with stress encounters [6] and fewer physical symptoms [13]. Originating from the theory of salutogenesis proposed by Antonovsky, this describes what helps an individual to stay well. SOC is defined as a global orientation that indicates the extent to which an individual can make sense of a challenging situation (i.e. comprehensibility) and successfully manage the situation (manageability) if it is perceived to be worth doing (meaningfulness) [14, 15]. In this theory, SOC is the key determinant for an individual to stay healthy, as people with this orientation are more able to use active coping to achieve good health even in overwhelmingly stressful situations [16]. Salutogenesis is a term derived from Latin and means 'the origin of health'. Previous studies have indeed shown that SOC partially mediates the effects of perceived stress in promoting depression and a poor quality of life among carers of dependent [17] and sick individuals [18–20].

Despite the proposed health-enhancing benefits of SOC, it is often thought to be determined by early-life experience, which may deter efforts to enhance it. However, evidence is emerging to contradict this proposition. According to Antonovsky, SOC is shaped by generalised resistance resources (GRRs), which refers to a range of internal and external characteristics (e.g. ego identity, knowledge, social support and coping strategies). People with better GRRs should be more successful at dealing with challenges, and the resulting more coherent life experience should cultivate a positive view of the controllability, predictability and meaningfulness of stressful events (i.e. an SOC). Such perceptual change, in turn, renders an individual to be more proactive in identifying and mobilising available GRRs to resolve problems instead of escaping. Mutual feedback between perceptual and behavioural mechanisms leads to a high degree of SOC [21]. Active strategies for increasing the awareness and mobilisation of GRRs may remodel behavioural responses to stressors [22] and generate more positive views towards the comprehensibility, manageability and meaningfulness of events (i.e. a perceptual response) [22] and thereby reinforce one's SOC.

There is a dearth of research on ways to strengthen the SOC of family carers of PwD. Previous studies have used therapeutic dialogues or action-based psychodramatic methods to increase the SOC of people with mental health problems [21, 23] or burnout [24]. The interventions focused on improving awareness of GRRs (i.e. a perceptual mechanism) without empowering participants to mobilise such resources.

We conducted a randomised controlled trial to examine the effects of a strength-based intervention that incorporates both narrative and empowerment strategies to optimise SOC, coping, caregiving burden, depression and health-related quality of life (HRQoL) of family carers of PwD. It was hypothesised that the beneficial effects of the intervention, if any, would be mediated through SOC and coping.

Methods

Study design and population

The double-blind, parallel group, individual RCT was conducted between May 2017 and August 2019 in 24 community centres for older adults operated by 12 NGOs in Hong Kong. Participants were eligible if they (i) were Chinese family carers of PwD diagnosed for ≥ 1 year, (ii) lived with the PwD and (iii) provided care for ≥ 4 hours/day. Participants were excluded if they reported a history of psychiatric disorders. Recruited participants were randomly assigned to either an intervention or control group at a 1:1 ratio through computer-generated random codes in sealed opaque envelopes. Conservatively assuming an effect size (Cohen's d) of 0.3 on HRQoL, a sample of 186 carers per group (80% power at $\alpha = 0.05$, 15% attrition rate) was proposed [25, 26]. All participants gave written informed consent.

To maintain the blinding, one research assistant who recruited the participants collected their demographic and baseline outcome evaluation data. Then, she randomised the subjects to receive the strengths-based or education intervention. The participants received no information about whether the intervention was for testing or control. Another research assistant with no information regarding the group allocation conducted the post-test outcome evaluation to prevent the observer effect. Details of the data collection procedure were outlined in the published study protocol [21].

Study groups

The strength-based intervention and the educative intervention (comparator) are outlined in the Template for Intervention Description and Replication (TIDieR; refer to the Supplementary Materials). The strength-based intervention integrated skills from narrative therapy and empowerment strategies to support carers of PWD in identifying and mobilising their GRRs to enhance coping with caregiving. The intervention comprised 14 weeks of 90-minute sessions and two bi-weekly telephone follow-ups. In addition to orientation and round-up sessions, there were two consecutive sessions on each of the six core areas of dementia caregiving, namely: (i) handling functional loss, (ii) handling challenging behaviours, (iii) communication and interaction with PwD, (iv) gauging the capabilities of PwDs, (v) dyadic relational strain and (vi) self-care for caregivers. The therapist who delivered the intervention had expertise in dementia care and counselling. The detailed protocol has been published elsewhere [21].

The first session on each core area applied narrative therapy to increase the participants' awareness and confidence in their potential GRRs through externalisation and re-authoring conversations. Externalisation conversations encouraged participants to use metaphors (e.g. a tunnel or garden) to represent their experiences as a life adventure (i.e. a caregiving journey) from the starting point to a desirable destination. In doing so, participants were able to realise how

problems evolve and predict challenges to be overcome. Re-authoring questions were then asked to identify situations in caregiving that appeared unproblematic. The therapist enquired into the actions, events, personal characteristics and strengths of the caregivers that led to the avoidance of problems. In this way, GRRs were identified. In the subsequent session, empowerment strategies were applied to enable more 'successful behavioural' changes in caregiving through goal-setting. Proactive actions were proposed to mobilise GRRs in caregiving. Interactive educational strategies, including role play, scenario-based group activities and counselling were used to develop knowledge and tactical and situational skills for dementia caregiving and to optimise the use of the identified GRRs in the process. Any concerns or barriers relating to goal attainment were discussed as part of a collaborative partnership.

The control intervention was basic education on dementia caregiving and comprised seven bi-weekly group-based information seminars (45 minutes/session) and two bi-weekly follow-ups through telephone calls. The basic education content was similar to that used in the empowerment phase of the strength-based intervention [21], although different topic labels were used to better represent the strength-building activities for the intervention group. An education intervention was used as the comparator, as this common dementia caregiving support service has been found to have no effect on SOC [27]. No narrative or empowerment strategy was used to increase awareness or utilisation of GRRs. Any additional inquiries from the carers during the training were documented in a reflective note to enable fidelity checking by the researchers.

Outcome measures and data collection

The primary outcome was HRQoL measured using the Medical Outcomes Study 36-item Short Form Health Survey (SF-36) and mental (MCS) and physical (PCS) component scores were reported [28]. Other outcome measures were the SOC Scale [29], the Simplified Coping Style Questionnaire (SCSQ) [30], the Zarit Burden Inventory (ZBI) [31] and the Center for Epidemiologic Studies Depression Scale (CES-D) [32] (detailed in the Supplementary Materials). All outcome measures were assessed at baseline (T0), Week 14 (T1) and Week 22 (T2) by trained research assistants. Details of the outcome measures were outlined in the Supplementary Materials (Supplementary Appendix 1).

Data analysis

Statistical analyses were performed using Stata Release 17 (StataCorp LLC, College Station, TX) in conjunction with R (version 4.2.1). The data were checked against the statistical assumptions of normality, linearity, homoscedasticity and multicollinearity. The assessment method is detailed in Supplementary Appendix 2. Descriptive statistics were used to compare the two groups at baseline, and those that were different between the two groups at $P < 0.10$ were adjusted. To test the core research hypothesis that the strength-based

intervention had greater effects than basic education in improving the health outcomes of family caregivers over the evaluative period from T0 to T2, a generalised estimating equation (GEE) was conducted to identify the different effects of the grouping factor (i.e. strength-based intervention and education intervention) on the changes in the outcomes across the three evaluative timepoints. The group*time interaction effect was regarded as the critical indication of the differential change across the evaluative period between the two groups [33]. GEE was used because this method accounts for intra-correlated pre-test and post-test measures and accommodates missing data if the data are missing at random [34]. The Little's Missing Completely at Random (MCAR) test was used with $P > 0.05$ indicating that the pattern of missing data fulfil this criterion. Multiple imputations will be done by using SPSS (version 28) accordingly. To further investigate when the significant differential change occurred, we conducted a pairwise treatment comparison using the 'difference contrast' of the General Linear Model. The adjusted mean and the 95% confidence interval of the differential change over time between the two study groups were reported (with the baseline as the reference point) and the partial eta square was computed to indicate the effect size of the between-group difference in the changes.

Next, outcome variables that differed significantly at both evaluative time points were included in a three-wave mediation model. The model was examined by means of path analysis with parallel mediation, if appropriate, using the lavaan package in R [35]. Path analysis was used because it is efficient as it can include all related variables to estimate the paths in a single-step process. The model was refined by adding or freeing theoretically plausible paths using modification indices. Model fit statistics included comparative fit index (CFI), root-mean-square error of approximation (RMSEA) and standardised root-mean-square residual (SRMR) with respective cut-off points of >0.95, ≤ 0.06 and ≤ 0.08 [36].

Results

The CONSORT diagram is shown in Supplementary Appendix 7. Of 433 eligible family caregivers, a total of 372 participants were evenly randomised in 31 blocks to receive the strength-based intervention or the educational intervention. Among them, 22 (strength-based intervention: $n = 20$; educative intervention: $n = 2$) declined to participate after randomisation and before the first exposure to the assigned intervention. The major reason to decline was not being able to commit to the in-person sessions ($n = 15$) when the research assistant started to make the scheduling. Referring to the International Committee on Harmonization Statistical Principles for Clinical Trials (ICH E9), these participants were excluded without violating the ITT principles to prevent systematic bias [37, 38]. Accordingly, 350 participants (mean age $= 64.9$, SD $= 12.3$) were included in the analysis [strength-based intervention:
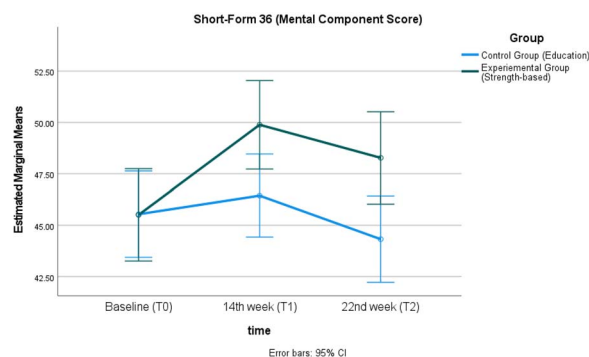

Figure 1. Temporal profile plot for Short-Form 36 (Mental Component Score).
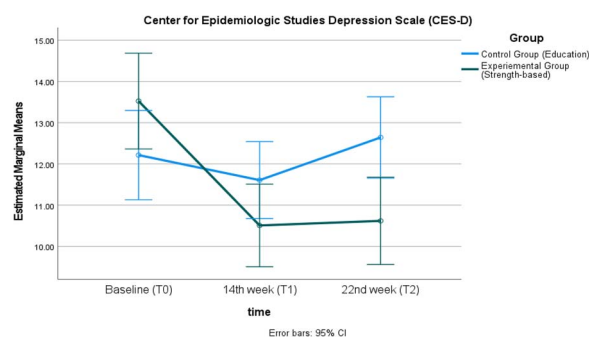

Figure 2. Temporal profile plot for Center for Epidemiologic Studies Depression Scale.

($n = 166$); educational intervention: ($n = 184$)]. Female carers were over-represented (84.6%). The baseline characteristics of the study groups were similar, but the intervention group was slightly younger (64y versus 66y), and more participants in the control group received tertiary education (27% versus 20%) (Table 1). These two variables were adjusted for in the GEEs and mediation analyses.

Table 2 presents the results of the differential changes in the outcome variables over the outcome evaluative period between the strength-based and education groups. The GEE results indicated that, as compared with the control group, the strength-based intervention group reported significantly greater improvements in SF-36 mental component score (MCS) (Beta (95% CI) $= 3.91(0.61–7.20)$, $P = 0.02$, Figure 1), depression (Beta(95% CI) $= -3.22(-4.64–1.79)$, $P < 0.001$, Figure 2), perceived burden (Beta(95% CI) $= -7.28(-10.79–3.76)$, $P < 0.001$, Figure 3) and SOC (Beta(95% CI) $= 3.65(0.59–6.70)$, $P = 0.02$, Figure 4) in the outcome evaluative period. Among the SOC domains, the sense of meaningfulness showed a significantly greater change in the strength-based intervention group. Nevertheless, there was no significant difference in the changes in the SF-36 physical component score and coping between the two groups, and the temporal profile plots are outlined in Supplementary Appendices 3–5.

To further compare the group difference in the changes of outcomes from baseline to the two post-test endpoints,

Table 1. Sociodemographic profile of the PwDs and their caregivers

|	Strength-based intervention ($n = 166$)	Education intervention ($n = 184$)
Caregiver characteristics		
Age, years (SD)	63.7 (11.3)	66.0 (13.0)
Gender, n (%)		
Female	138 (83.1%)	158 (85.9%)
Male	28 (16.9%)	26 (14.1%)
Presence of spouse, n (%)		
Yes	116 (69.9%)	129 (70.1%)
No	49 (29.5%)	55 (29.9%)
Education level, n (%)		
No formal education	8 (4.8%)	15 (8.2%)
Primary school	43 (25.9%)	57 (31.0%)
Secondary school	82 (49.4%)	63 (34.2%)
Tertiary school or above	33 (19.9%)	49 (26.6%)
Employment status, n (%)		
Full-time job	22 (13.3%)	20 (10.9%)
Part-time job	19 (11.4%)	13 (7.1%)
No occupation	125 (75.3%)	151 (82.1%)
Relationship with the PWD, n (%)		
Spouse	75 (45.2%)	92 (50.0%)
Children or in-law	84 (50.6%)	82 (44.6%)
Grandchildren or in-law	1 (0.6%)	2 (1.1%)
Sibling	5 (3.0%)	5 (2.7%)
Other (relative or friend)	1 (0.6%)	3 (1.6%)
Year of caregiving, months (SD)	68.40 (76.8)	82.92 (111.77)
Hours of caregiving/day (SD)	12.93 (8.23)	12.52 (8.94)
Characteristics of the PWD		
Age, years (SD)	82.5 (7.5)	82.6 (7.3)
Gender, n (%)		
Female	88 (53.0%)	92 (50.3%)
Male	78 (47.0%)	91 (49.7%)
Stage of dementia, n (%)		
Early stage	42 (25.3%)	62 (33.9%)
Middle stage dementia	63 (38.0%)	70 (39.3%)
Late-stage dementia	15 (9.0%)	12 (6.6%)
Unknown	46 (27.7%)	39 (21.3%)
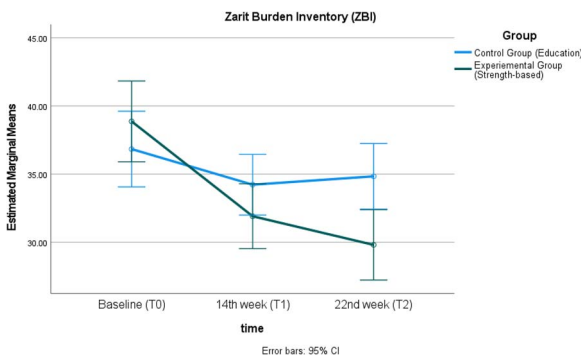
Figure 3. Temporal profile plot for Zarit Burden Inventory.

Table 2 shows the corresponding adjusted mean difference (MD) and partial eta square. For MCS and SOC, the between-group adjusted MD in change of outcomes from baseline to T1 (i.e. upon the completion of intervention) were 3.57 (95% CI = 1.00–6.15, $\eta_p^2 = 0.03$) and 2.63 (95% CI = 0.23–5.02, $\eta_p^2 = 0.02$), respectively, consistent
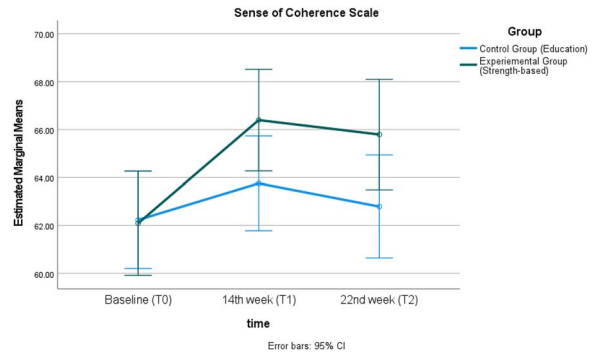

Figure 4. Temporal profile plot for Sense of Coherence Scale.

with the small benefit of the strength-based intervention. Such between-group differential improvement was sustained until the follow-up endpoint (T2) at the similar effect size [MCS: adjusted MD = 3.96 (95% CI = 1.10–6.82, $\eta_p^2 = 0.03$); SOC: adjusted MD = 3.07 (95% CI = 0.26–5.88, $\eta_p^2 = 0.02$)]. As for CES-D and ZBI, the differential changes between the groups from baseline to T1 were found to favour the strength-based intervention at small-effect size [CES-D: adjusted MD = −1.66 (95% CI = −2.82–0.50, $\eta_p^2 = 0.03$); ZBI: adjusted MD = −3.22 (95% CI = −5.94–0.51, $\eta_p^2 = 0.02$)], and such between-group difference reached a medium effect size at T2 [CES-D: adjusted MD = −3.33 (95% CI = −4.81–1.86, $\eta_p^2 = 0.07$); ZBI: adjusted MD = −6.00 (95% CI = −8.96–3.05, $\eta_p^2 = 0.06$)]. This implies that the improvement in depression and burden among the strength-based intervention group continued to evolve even after the completion of training.

In the path analysis, after adjusting for the effects of age and educational level, the strength-based intervention increased SOC at Week 14 ($\beta = 0.11$, $P = 0.029$) and a better SOC led to improvement in mental health at Week 22 ($\beta = 0.19$, $P = 0.001$). SOC at Week 14 fully mediated the relationship between the intervention and mental health at Week 22 (Figure 5). The goodness-of-fit indicators showed an excellent data-model fit (CFI = 0.996, RMSEA = 0.035, SRMR = 0.021). The intervention also significantly reduced depression ($\beta = -0.13$, $P = 0.010$), and there was a significant indirect effect on this outcome through SOC ($\beta = -0.14$, $P = 0.021$) (Figure 6). This suggests that an increased SOC partially mediated the relationship between the intervention and depression at Week 22 post-test. The fit indices basically suggested a data-model fit (CFI = 0.99, SRMR = 0.033), although the RMSEA slightly exceeded the criterion level (0.064). As for perceived burden, the mediating effect of the SOC was not significant (Supplementary Appendix 6).

Discussion

This study showed that the strength-based intervention designed to improve SOC was effective in improving the well-being of family caregivers of PwD. Specifically,

Table 2. Comparisons on the change of outcomes over the study endpoints between the study arms.

Outcome variables	Strength-based intervention group Mean (SD)	Education-based control group Mean (SD)	Time × group interaction effect Generalise Estimating Equation		Between-group difference in the change from baseline	
			B (95% CI)	P value	Adjusted mean (95% confidence interval)	Partial eta square
SF-36 (MCS)						
Baseline (T0)[a]	45.51 (13.63)	45.54 (12.33)	3.91 (0.61, 7.20)	0.02		
14th week (T1)	49.91 (11.66)	46.45 (12.83)			3.57 (1.00, 6.15)	0.03
22nd week (T2)	48.28 (13.48)	44.33 (12.28)			3.96 (1.10, 6.82)	0.03
SF-36 (PCS)						
Baseline (T0)[a]	36.39 (16.145)	35.68 (13.87)	0.74 (−2.37, 3.86)	0.64		
14th week (T1)	38.11 (14.72)	38.45 (14.19)			−0.90 (−3.41, 1.61)	0.02
22nd week (T2)	38.58 (14.73)	37.25 (15.23)			0.91 (−1.99, 3.81)	0.001
CES-D						
Baseline (T0)[a]	13.52 (6.92)	12.21 (6.35)	−3.22 (−4.64, −1.79)	<0.001		
14th week (T1)	10.51 (5.68)	11.61 (5.74)			−1.66 (−2.82, −0.50)	0.03
22nd week (T2)	10.62 (6.25)	12.64 (5.83)			−3.33 (−4.81, −1.86)	0.07
ZBI						
Baseline (T0)[a]	38.87 (16.52)	36.84 (17.37)	−7.28 (−10.79, −3.76)	<0.001		
14th week (T1)	31.91 (13.98)	34.23 (13.34)			−3.22 (−5.94, −0.51)	0.02
22nd week (T2)	29.81 (15.96)	34.84 (13.60)			−6.00 (−8.96, −3.05)	0.06
SCSQ: positive coping						
Baseline (T0)[a]	20.97 (7.26)	21.31 (6.78)	.58 (−1.16, 2.31)	0.52		
14th week (T1)	22.68 (6.48)	22.40 (5.97)			0.40 (−0.91, 1.72)	0.001
22nd week (T2)	21.19 (6.54)	20.80 (5.98)			0.50 (−0.90, 1.90)	0.002
SCSQ: negative coping						
Baseline (T0)[a]	13.14 (4.01)	14.22 (3.73)	0.31 (−0.70, 1.32)	0.55		
14th week (T1)	12.73 (3.84)	13.75 (3.40)			−0.77 (−1.59, 0.06)	0.01
22nd week (T2)	12.46 (3.49)	13.21 (3.02)			−0.56 (−1.33, 0.21)	0.08
SOC						
Baseline (T0)[a]	62.10 (11.95)	62.23 (12.79)	3.65 (0.59, 6.70)	0.02		
14th week (T1)	66.40 (11.41)	63.76 (12.66)			2.63 (0.23, 5.02)	0.02
22nd week (T2)	65.79 (12.78)	62.79 (13.44)			3.07 (0.26, 5.88)	0.02
SOC: meaningfulness						
Baseline (T0)[a]	18.23 (4.85)	18.42 (5.02)	1.47 (0.24, 2.67)	0.02		
14th week (T1)	19.63 (4.60)	18.87 (4.66)			0.75 (0.21, 1.71)	0.01
22nd week (T2)	19.28 (4.50)	18.01 (4.952)			1.34 (0.28, 2.40)	0.02
SOC: manageability						
Baseline (T0)[a]	19.69 (4.723)	19.83 (4.91)	0.95 (−0.22, 2.12)	0.11		
14th week (T1)	21.04 (4.78)	20.21 (4.56)			0.90 (−0.05, 1.85)	0.01
22nd week (T2)	20.89 (5.22)	20.19 (4.81)			0.76 (−0.29, 1.81)	0.01
SOC: comprehensibility						
Baseline (T0)[a]	24.31 (5.72)	23.99 (5.35)	1.21 (−0.105, 2.53) 0.07			
14th week (T1)	25.81 (4.74)	24.68 (5.13)			0.99 (−0.06, 2.04)	0.012
22nd week (T2)	25.74 (5.37)	24.59 (5.36)			1.02 (−0.15, 2.18)	0.011

SF-36 MCS = Short-Form 36 Health Survey Mental Component Score; SF-36 PCS = Short-Form 36 Health Survey Physical Component Score; CES-D = Center of Epidemiological Studies – Depression; ZBI = Zarit Burden Inventory; SCSQ = Simplified Coping Style Questionnaire; SOC = Sense of Coherence. Partial eta square: 0.01 small effect size; 0.06 = medium effect size; 0.14 = large effect size. [a]Baseline measurement as the reference group.

our findings indicate that over the 22-week evaluation period, positive changes in SF36 MCS and depression were mediated through improvement in SOC. The findings confirm the dynamic nature of SOC in real-life situations. In addition, improvement in other health outcomes, including carers' mental health, burden and depression, supports Antonovsky's theory of salutogenesis, that SOC is an important inner strength that drives an individual to achieve better health even when living in a challenging life situation.

A meta-review of 500 studies of non-pharmacological interventions for dementia family caregivers, showed that strength-based interventions could reduce depression and improve mental wellness [39]. The meta-review showed weak evidence on perceived burden, but our strength-based intervention, had a positive effect on this outcome with a moderate effect size.

As perceived burden is characterised as a form of sustained and multi-faceted strain [40], interventions that enhance inner strength may be more effective in increasing carers' perseverance and tenacity to tackle ever-evolving challenges in stressful encounters. The significant role of SOC in mediating the effects of the strength-based intervention on depression and mental health supports this proposition. In addition, these findings are consistent with the results of other
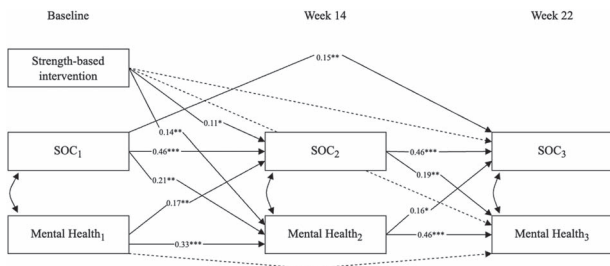
Figure 5. Path analysis model depicting the relationship among strength-based intervention, SOC and mental health. All the coefficients were standardised; dashed lines indicate insignificant path effect; $^*P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$, Mental Health$_1$ = mental health at baseline, Mental Health$_2$ = mental health at Week 14; Mental Health$_3$ = mental health at Week 22.
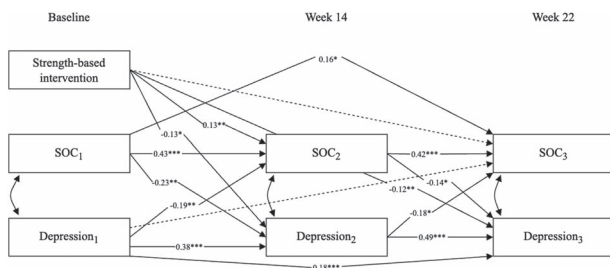

Figure 6. Path analysis model depicting the relationship among strength-based intervention, SOC and depression. All the coefficients were standardised; dashed lines indicate insignificant path effect; $^*P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$; Depression$_1$ = depression at baseline; Depression$_2$ = depression at Week 14, Depression$_3$ = depression at Week 22.

studies that found that the SOC reduced the effect of a stressful encounter on mental health among dependent older adults and cancer patients [17–20].

The positive effects of our strength-based intervention on depression, perceived burden and mental health are consistent with the health benefits of strength-based interventions that are underpinned by other theoretical paradigms among dementia carers [41–43]. The intervention of Cheng et al. [41, 42], which used cognitive reappraisal to support caregivers in finding positive gains, was found to be more effective than psychoeducation in reducing depression, and such effects were mediated through participants' self-efficacy in controlling dysfunctional thoughts. The protective effect of the strength-based intervention reported here may be related to the active engagement of the family caregivers in revisiting the evolution, impact and meaning of the caregiving experiences through therapeutic dialogue. The deliberate use of facilitated self-disclosure and self-reflection might have altered the meaning-making process of the carers, and might therefore explain the greater improvement in perceived meaningfulness among the three SOC components. The combined use of analytic dialogue to identify GRRs

(perceptual mechanisms) and empowerment strategies to mobilise such resources (behavioural mechanism) may also lead to positive changes in perceived burden and mental well-being immediately after the strength-based intervention. Such prompt therapeutic effects were not observed in a study of a benefit-finding intervention, which were delayed until the 4th and 12th months [41]. By contrast, the ANSWER project of Judge et al., which incorporated a systematic assessment of the collective strengths of the care dyads, followed by skills training, showed treatment benefits for carers' burden, depression and mental health similar to those reported here [43]. As a dyadic intervention, the improved carers' outcomes might be related to the combined effects of the intervention and the improved outcome for PwD.

Surprisingly, the strength-based intervention did not improve coping by carers. The use of an active educational control might explain the result, as both study arms showed improvement in this outcome. As compared with the educational intervention, the uniqueness of the strength-based intervention might be related to its positive effect on perceived meaningfulness. Caregivers who are able to derive meaning from a stressful encounter are more committed to overcome the challenges and to adapt the changes. The health-enhancing effects of the strength-based intervention might be more appropriately interpreted in an existential rather than stress-coping paradigm. A previous review highlighted the effect of meaning-making on improving the well-being of carers in dementia contexts [44].

Theoretically, the findings support the proposition of Antonovsky's theory of salutogenesis that SOC drives an individual to the favourable end of the health continuum, and this disposition can be regulated through modulating the individual's perceptual and behavioural responses to a stressful encounter. From a practice perspective, the study findings call for a paradigm shift in designing carer support services. Instead of focusing on the deficits of family carers (problems), analytic dialogues are effective in engaging the carers in self-reflection, during which time their attention can be directed to successful caregiving experiences. In our experience, carers appeared to have more positive self-affirmation as the 14-week strength-based training progressed. On several occasions, when carers mentioned problematic caregiving situations, peer carers in the group asked each other to recall any successful experience from which they could gain insights to inform a possible resolution. These examples indicate an increased ability of the carers to manage stressful encounters (manageability). Peer interaction in the implementation process is crucial, and goal-setting processes further provide an explicit means of integrating such strengths to tackle caregiving difficulties. Despite our strength-based approach requiring carers to engage in self-disclosure, the active engagement and high attendance rate suggest that they appreciated the opportunity to ventilate and be listened to. As the competing caregiving role was the most common reason for attrition, temporary respite is recommended to secure the carers' availability and readiness

to participate. In addition, the COVID-19 pandemic has catalysed the application of digital care. Future research can explore the potential of delivering the strength-based intervention online, and novel strategies that optimise caregivers' self-disclosure and group dynamics are needed.

The present research has limitations. First, although previous studies identified the ineffectiveness of information-giving on caregivers' health [45], the lack of a no-treatment control group does not allow the estimation of the net effects of the strength-based intervention. In view of the improved coping response of the control group, the study can be replicated by comparing the strength-based intervention with an attention-placebo or waiting list control. Second, the over-representation of female carers might limit the generalisability of the findings. With the current increase in the number of males assuming caregiving responsibilities and the gender-specificity of role enactment [46, 47], future studies may attend to the specific needs of carers from different gender perspectives. We did not achieve the planned sample size due to the attrition in the period after randomisation and the first exposure. The evolution of the pandemic also added challenges to replace the loss, although the study had adequate power to detect the intervention effects on most of the outcomes. In fact, the major reason for the pre-exposure attrition was due to the challenge of committing to the weekly session of the 14-week programme. Based on our current experience of delivering the strength-based intervention, a briefer version needs to be developed to enhance its accessibility to caregivers. The increasing popularity of using a virtual platform to deliver caregiver support may also offer an opportunity to enhance strength-based interventions. Finally, it is noted that the strength-based intervention had a small effect on SOC at the first post-intervention endpoint, but none of the subdomain scores showed statistical significance. Although the total score should be more sensitive to change, future research should further investigate whether the SOC can be improved in a shorter time period (i.e. 14 weeks).

In conclusion, this RCT is the first to adopt a strength-based paradigm to enhance the health outcomes of dementia family caregivers. The findings imply that SOC is an inner strength that can not only be remodelled but also be enhanced by intervention. This attribute brings about health benefits, particularly from a psychological perspective. With the predominant use of stress and coping models to underpin caregiver support interventions, this study makes explicit the importance of incorporating a salutogenic approach in optimising the inner strengths of family caregivers.

Impact statement

We certify that this work is novel

Taking care of persons with dementia is associated with a tremendous impact on the well-being of family caregivers. Research in the past decades has predominantly used the stress and coping paradigm to develop supportive interventions for this vulnerable group. Even though there is increasing attention to the role of sense of coherence in protecting the health of individuals during a stressful encounter, no research has attempted to remodel this inner strength for promoting the health outcomes of dementia family caregivers. Based on Antonovsky's Theory of Salutogenesis, we adopted an eclectic approach to integrate strategies of narrative therapy and empowerment therapy to enhance the sense of coherence and thereby the health outcomes of dementia family caregivers. This paper presents the results of an RCT that examined its empirical effects. The findings would have theoretical and practical implications for advancing the Antonovsky's Theory of Salutogenesis and the intervention to promote caregivers' health.

Authors' Contributions: D.S.F.Y. conceptualised the overall study, coordinate the subject recruitment and data acquisition, data analysis and interpretation and lead the manuscript writing.

S.-T.C. has been involved in conceptualise the study and provide expert insights on how to integrate the theoretical paradigm to develop the strengths-based approach to support the family caregivers. He also provided expert input in the trial design, data analysis and manuscript review.

E.O.-W.C. has been involved in conceptualise the study and provide expert insights on how to integrate narrative strategies to the strengths-based intervention. She has supported the subject recruitment and the intervention protocol development. She also provided expert input in reviewing the manuscript.

T.K. has been involved in conceptualise the study He has provided high level of supported the subject recruitment and data acquisition. He also gave expert input in reviewing the manuscript.

B.M. has provided expert input in the study conceptualisation. He also gave expert input in reviewing the manuscript.

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