






ORIGINAL ARTICLE

Pilot evaluation of a home-based multi-sensory cognitive stimulation intervention for older people with dementia and caregiver dyads during the COVID-19 pandemic

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Abstract

Introduction: The impact of the current pandemic on people with dementia (PWD) and their caregivers has been profound. The lockdown and social distancing rules have left many PWD homebound and lacking stimulation. A home-based multi-sensory cognitive stimulation intervention (HMCSP) is presented to address this problem.

Aims: To examine the feasibility and preliminary efficacy of an HMCSP on PWD and their family caregivers during the COVID-19 pandemic.

Methods: A two-armed, non-randomised, parallel clinical trial design was adopted. Seventy-two people in dementia-caregiver dyads were assigned to either the intervention group, which received the HMCSP 3 times per week for 15 weeks ($n = 36$) or the wait-listed control group ($n = 36$). Various health-related outcomes were measured at baseline, immediately after the intervention and at the 3-month follow-up. A process evaluation was conducted through focus groups.

Results: Intervention feasibility was established with a high recruitment rate (93.06%) and low attrition rate (5.56%). The results of the generalised estimating equation indicated that the intervention group experienced significantly greater improvements in the positive aspect of caregiving (95% confidence interval [CI] = $-9.42, -3.70$, $p = .001$), stress (CI = $0.45, 3.06$, $p < .009$), burden (CI = $2.20, 7.52$, $p < .001$) and quality of life (QoL) (CI = $-3.05, -1.05$, $p < .001$) of the caregivers; and in the BPSD (CI = $1.92, 4.10$, $p < .001$) of the PWD at the post-test. Sustainable effects were only found in the positive aspect of caregiving (CI = $-3.76, -0.53$, $p < .009$), QoL of the caregivers (CI = $-2.40, -0.78$, $p = .009$) and BPSD (CI = $-0.54, 3.07$, $p = .005$) at the 3-month follow-up. Focus groups revealed three major themes: impacts on the dyadic relationship, impacts on the people with dementia and difficulty of implementation.

Conclusion: The HMCSP is a feasible intervention for the dyads. Potential effects were found on the psychological well-being of the caregivers, PWD and the dyadic relationship. The findings of this study contributed to existing research on pandemic periods, when home-based interventions are favoured.

KEYWORD

caregiving, cognitive stimulation, community nursing, dyadic relationship, family caregiver

1 | BACKGROUND

1.1 | The surging need for home-based interventions for people with dementia in a time of pandemic

The impact of the current pandemic caused by the Coronavirus Disease 2019 (COVID-19) has been profound on people with dementia (PWD) and their family caregivers (Canevelli et al., 2020). Many places in the world went into lockdown or endured strict social isolation rules. Many community dementia services, including home-visiting services and centre-based activities, were suspended, leaving many community-dwelling PWD homebound and feeling isolated and lonely (Berg-Weger & Morley, 2020). The suspension of services also left family caregivers with additional caregiving tasks. A survey showed that around 30% of community-dwelling PWD experienced significant cognitive deterioration and 54% noticed a worsening of neuropsychiatric symptoms during the lockdown, while around 50% of caregivers reported feeling a higher level of stress (Canevelli et al., 2020). In the face of this situation, supporting home-living PWDs and their caregivers has become an urgent concern. Many national and local guidelines have highlighted the importance of maintaining regular meaningful activities at home during the pandemic and have suggested that home-based interventions are a good alternative to face-to-face interventions in a time of pandemic (Cohen et al., 2021). However, there has been limited evidence on the delivery of dementia support services during the COVID-19 pandemic.

1.2 | The use of home-based interventions for people with dementia

A non-pharmacological intervention such as a cognitive stimulation intervention is regarded as a first-line intervention for PWD (Douglas et al., 2004). Its use in residential care settings and community centres has been widely investigated in previous studies but only a few of those studies were conducted in home settings (Meyer & O'Keefe, 2020). Compared with traditional centre-based interventions, the home-based, caregiver-delivered approach can more feasibly be carried out as it can be conducted by caregivers at any time and anywhere without the presence of healthcare professionals but still provide PWD who are homebound in a time of pandemic with meaningful opportunities for engagement. However, caregiver-delivered interventions for PWD invariably arouse concerns regarding the feasibility and acceptability of

Summary statement on implications for practice

What does this research add to existing knowledge in gerontology?

- The home-based multi-sensory cognitive stimulation intervention was feasible and demonstrated promising effects on the well-being of the PWD-caregiver dyads and their relationship during the pandemic.
- We found no evidence suggesting that a caregiver-delivered intervention would place caregivers under stress. Instead, we found that such an intervention improved the caregiving experience.

What are the implications of this new knowledge for nursing care with older people?

- The home-based multi-sensory cognitive stimulation intervention can be used as an alternative intervention during the pandemic when face-to-face group interventions cannot feasibly be carried out.
- The intervention could be further extended to people with dementia who have fewer opportunities to receive interventions from a trained professional (e.g. those living in rural areas).
- Our home-based multi-sensory cognitive stimulation intervention can serve as a reference for the design of a home-based intervention for other countries that have also been impacted by the pandemic.

How could the findings be used to influence policy or practice or research or education?

- Policymakers/clinicians should give greater consideration to the widespread use of home-based interventions in the future as such interventions can be flexibly adapted to crises where face-to-face interventions delivered by professionals are not feasible.
- A large randomised controlled trial is required to confirm the effectiveness of our home-based multi-sensory cognitive stimulation intervention.

the intervention and fidelity to the intervention. The existing literature has shown inconclusive results in this aspect (Leung et al., 2017). For example, the use of a caregiver-delivered cognitive stimulation therapy

(CST) was examined in a large-scale randomised controlled trial (RCT) ($n = 273$). Training caregivers to deliver the CST to PWD was shown to be a success, but a low adherence rate was reported due to the intensive intervention schedule (three times/week for 6 months) (Orrell et al., 2017). Promising effects were found on the QoL and caregiving experience of the caregivers, but there was no effect on the cognition of the PWD. A systematic review also found that a cognitive-based intervention involving caregivers appeared to reduce the caregiver burden to a larger extent than a carer-focused intervention (Laver et al., 2017). A more recent review also showed that CSTs delivered by caregivers are effective at reducing the Behavioural and Psychological Symptoms of Dementia (BPSD) as well as the moodiness and anxiety of family caregivers and improving the quality of life of the dyads (Alves et al., 2020). To enhance the fidelity of caregiver-delivered cognitive-based interventions, Milders et al. (2013) suggested they include several components, such as giving caregivers adequate training to enable them to follow the intervention protocol as instructed, providing them with a manual with instructions and activities, providing on-going monitoring of the delivery of the intervention and teaching caregivers how to evaluate the response of the PWD. We adopted these components when developing our intervention.

Although existing studies had already demonstrated the feasibility of caregiver-delivered interventions, the majority of those studies were conducted among Western caregivers. Its feasibility in a Chinese context remains unknown. Difficulties in delivering home-based interventions have been discussed in another study conducted in a Chinese context (Wong, Lo, et al., 2018). For example, home environments in Hong Kong tend to be small and crowded. An over-crowded home environment has been reported to be a practical barrier (Wong, Lo, et al., 2018; Wong, Yek, et al., 2018) to the implementation of home-based interventions because at home elderly people were constantly distracted by other family members living in the same household. Furthermore, the cognitive stimulation and multi-sensory approaches were both rooted in Western cultures. In designing the sessions, cultural adaptations have to be made to the contents to take into account the preferences and interests of PWD (e.g. the games and materials used in the session have to be culturally adjusted) (Wong, Yek, et al., 2018). Overall, due to the above cultural and practical concerns, which can potentially affect the feasibility of implementing such an intervention in a Hong Kong Chinese context, we decided to conduct this feasibility study.

Overall, the existing literature on caregiver-delivered interventions reveals three important gaps in existing knowledge on the subject. First, home-based caregiver-delivered interventions appear to have the potential to improve the well-being of dyads, but more needs to be done to improve their feasibility of use; thus, a more feasible version of a caregiver-delivered intervention is required (Orrell et al., 2017). Second, the majority of studies on dyads have neglected dementia outcomes and the positive aspects of caregiving (e.g. personal growth) by exclusively assessing negative caregiving outcomes (e.g. burden) (Alves et al., 2020; Braun et al., 2009). As dementia outcomes are also part of the dyadic outcome, and both burden and benefits are associated with greater experience in caregiving (Grossman & Gruenewald, 2017), it is important to include all

of these outcomes when assessing the potential effects and effectiveness of an intervention. Third, research findings on caregiver-delivered cognitive-based interventions have mostly come from Western countries, raising concerns about their feasible and acceptability of use when applied in a Chinese context (Ma & Saw, 2020).

1.3 | Integrating cognitive stimulation and multisensory stimulation into a home-based intervention

In this study, we proposed the use of a home-based intervention because such an intervention can be delivered by family caregivers. This is particularly useful during the COVID-19 pandemic, given that traditional interventions delivered by professionals have mostly been suspended. Our intervention involves the use of cognitive stimulation and a multi-sensory stimulation approach. Cognitive stimulation (CS) is an intervention to actively stimulate participants mentally through a range of group activities and group discussions (Spector et al., 2003). A Cochrane review confirmed the efficacy of CS at bringing about cognitive improvements among PWD (Woods et al., 2012). However, a conventional CS programme largely focuses on the domain of language (Spector et al., 2010). By contrast, we decided to adopt a multi-sensory approach in our CS intervention, in the hope that PWD would make use of multi-sensory skills other than verbal skills, such as touch and smell, which conceptually might be more suitable for PWD, who tend to have reduced verbal ability (Finnema et al., 2000). Further, we deemed CS and multi-sensory approaches to be especially appropriate for integration with a home-based caregiver-delivered intervention because they have been designed to be easily delivered (Ali et al., 2018), and because the materials used in the sessions can easily be found at home (e.g. fruits, calendars, paper and pen).

A recent review paper also proposed a theoretical framework to explain the mechanism of how the involvement of caregivers in the cognitive-based interventions for PWD could improve their dyadic relationship, QoL and depressive symptoms (Leung et al., 2017) (Figure 1). This conceptual model was underpinned by the binding ties theory (Townsend & Franks, 1995), the enrichment process theory (Cartwright et al., 1994) and the scaffolding process theory (Cavanaugh et al., 1989). Dyadic interpersonal interactions play an important role in the family caregiving process. According to the conceptual model, the involvement of caregivers in the intervention could (1) broaden the understanding of dyadic interpersonal interactions, (2) lead to mutual sharing of pleasurable and meaningful activities and (3) result in the giving by caregivers of cognitive support, which is related to caregiver well-being (Leung et al., 2017). Moreover, dyadic interpersonal interactions are interrelated, acting as mediators to the psychological well-being of the caregivers, and the caregivers may experience various positive experiences during the interactions (Leung et al., 2017; Zarit, 2012). Therefore, this study was one of the few to look at the positive aspects of caregiving as well as at the related outcomes for caregivers and care-recipients. The aim of this study was to examine the feasibility and preliminary efficacy of a

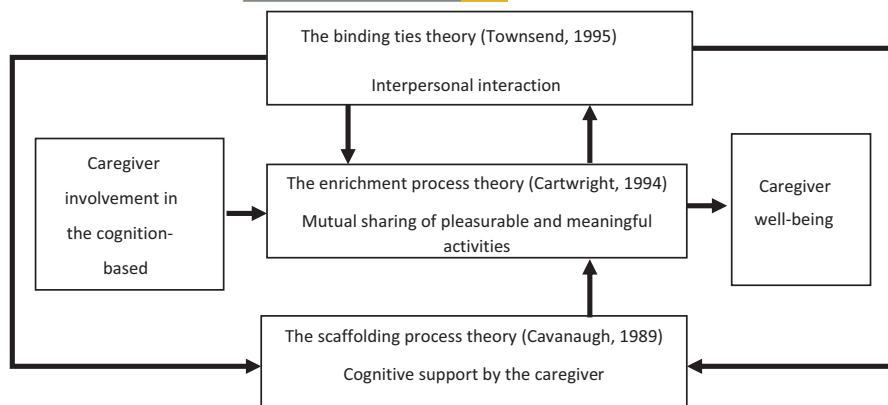


FIGURE 1 Theoretical framework explaining the effects of caregiver involvement on their well-being (Leung et al., 2017)

home-based caregiver-delivered intervention among Hong Kong Chinese PWD and caregiver dyads. Its findings can contribute to existing research on times of pandemic, when home-based non-pharmacological interventions are favoured.

2 | METHODS

2.1 | Design

A prospective, two-armed, non-randomised, single-blinded, parallel clinical trial design was adopted. The reporting of this study followed the Transparent Reporting of Evaluations with Nonrandomised Designs (TREND) statement (Des Jarlais et al., 2004). The study was conducted from September 2019 to December 2020 and was registered with [ClinicalTrials.gov](https://clinicaltrials.gov) (Ref: NCT03803592). Subject recruitment was carried out before the COVID-19 pandemic in September 2019 and the two face-to-face training sessions were conducted in the centres at the earlier stage of the pandemic when small group training sessions were still being permitted indoors.

2.2 | Objectives

1. To investigate the feasibility of conducting the HMCSP among family caregivers of PWD; and
2. To explore the preliminary effects of the HMCSP on: (a) the family caregivers of PWD in the aspects of positive caregiving experience, perceived stress, depression, burden and QoL, and; (b) PWD, in terms of their cognitive function and BPSD.

2.3 | Participants

The participants were community-dwelling PWD-caregiver dyads. We included dementia-caregiver dyads who fulfilled the following inclusion criteria:

- a. people with dementia: (1) aged 65 years or above; (2) who had been diagnosed with any type of dementia as defined by The International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) and (3) who were in the early to moderate stage of dementia, namely, stages 4–6 according to the Global Deterioration Scale. Since CST has been widely used among the early to moderate dementia population, we initiated this feasibility trial among this population to maximise the possibility of obtaining positive results. If it proves to be feasible and effective, it will then be tested on other populations.
- b. family caregivers: (1) aged 18 years or above; (2) related by blood or marriage (e.g. a spouse, sibling, child or grandchild) to a person who has been clinically diagnosed with dementia, regardless of type and who has been assuming caring responsibilities ranging from providing physical aid to emotional support, in the form of assisting with transportation, finances, personal hygiene and decision-making and (3) who has been providing most of the daily care and support for the person with dementia (daily contact for at least 4 h).

We excluded dementia-caregiver dyads who did not meet the above inclusion criteria and who met the following exclusion criterion: PWD and/or family caregivers who had been diagnosed with any acute physical or mental disease (such as bipolar disorder, schizophrenia, cancer or stroke) that might affect their ability to participate in the activities of the programme (Yates et al., 2014).

2.4 | Sample size

For an intervention with a conservative, small, standardised effect size of 0.2, an optimal sample size of 25 (per arm) was suggested for a pilot study to determine the size of the sample for the main study, designed with 90% power and two-sided 5% significance (Whitehead et al., 2016). After taking into consideration, an attrition rate of 20%, the targeted sample size was 60 PWD-caregiver dyads ($n = 30$ in each group) (Cocks & Torgerson, 2013; Qiu et al., 2019).

2.5 | Recruitment and settings

Convenience sampling was adopted to recruit participants in four community centres that provide elderly and dementia care services, located in four districts in Hong Kong. The centres are run by the same non-governmental organisation, and have very similar policies and characteristics. We assigned two centres to be the intervention group and the other two centres to be the wait-listed control group. Eligible potential participants were approached by the researchers and informed written consent to participate in the study was collected from both family caregivers and PWD. We followed 'The ethics of dementia research' guidelines published by Alzheimer Europe (2011) on obtaining consent from PWD. We carefully explained the study to the PWD and their caregivers and helped the PWD to go through the process of deciding whether they would take part in the study. Some negative responses (e.g. crying) would also be regarded as a sign of refusal to join the study. To follow the allocation concealment mechanism, an independent research assistant who had no knowledge of the four centres and was not involved in collecting data carried out the randomisation procedure through computer-generated random numbers. The control group would receive the HMCSP after completing the entire study. Both a caregiver and care-recipient had to agree to join the study; if either one declined, both would be considered to have refused to join the study or to have dropped out.

2.6 | Intervention

The HMCSP protocol was developed mainly based on the implementation guidelines for cognitive stimulation therapy and sensory activities for PWD (Aguirre et al., 2014; Vozzella, 2007). The HMCSP included various cognitively stimulating activities such as garnishing fruits and compiling photo albums, as well as multisensory stimulating activities such as tasting fruits, singing, and dancing, which were aimed at (1) stimulating different cognitive domains and senses of PWD through various enjoyable activities; and (2) promoting interaction and collaboration between the PWD-caregiver dyads. After balancing the intervention dosage and considering issues of feasibility and the duration and number of sessions from similar studies on cognitive stimulation therapy and multisensory activities (Kim et al., 2017; Strøm et al., 2016), we decided that this HMCSP should consist of 45 sessions held over 15 weeks. For face validity, the intervention protocol was reviewed by a group of experts that included nurses, social workers, occupational therapists and clinical psychologists.

The caregivers received 12 h of training including two training sessions (2h each) provided by healthcare professionals including nurses and social workers in the elderly centres (following the social distancing rules of COVID-19) and self-directed learning and practice through a booklet in between the two sessions. The booklet included manual instructions for each activity and instructions on using the 4F cycle (Facts, Feelings and Finding the future)

(Greenaway, 1992) to review and reflect on what they had gained and understood after the intervention. The caregivers were also provided with a 'Five Senses Box', which included such items as photographs and cards, supplemented for some activities by items from daily life provided by the caregivers (e.g. fruit and snacks). After the training, the family caregivers were asked to deliver the HMCSP at home 3 times per week for 45 min each time. In the first 10min of each session, the caregiver was instructed to follow the booklet and the cards in the 'Five Senses Box' to provide the PWD with orientation information such as the day, date and weather, followed by the main activities (Table 1). A weekly telephone follow-up was provided to monitor the progress of the caregivers and to ensure all difficulties were addressed in a timely manner. Caregivers were also actively encouraged throughout to get in touch with the team via a phone hotline if they had any queries.

To ensure intervention fidelity, we followed guidelines on the best practices and recommendations from the NIH Behaviour Change Consortium on treatment fidelity. The details are listed in Table 1.

2.7 | Wait-listed control

The participants in the wait-listed control group received the usual elderly care services in the community centres. These services included brief education sessions on caregiving skills, meal delivery and financial assistance whenever necessary.

2.8 | Measurement

The participants were invited to complete a set of outcome measures (described below) either online, by mail or by telephone (by telephone for all the outcomes of the PWD) at baseline (T0), immediately after the intervention (T1) and at the 3-month follow-up (T2):

1. *The feasibility of the interventions was assessed by the recruitment rate, attrition rate and the length of time it took the caregivers to complete the HMCSP* (Eldridge et al., 2016).
2. *The family caregivers' positive caregiving experience (primary outcome) was measured using the Chinese version of the Positive Aspect of Caregiving (PAC) scale* (Lou et al., 2015). The PAC scale demonstrated acceptable levels of internal consistency, with a Cronbach's alpha of 0.85, among the family caregivers of PWD in Hong Kong (Lou et al., 2015). Higher scores indicated more positive self-perceptions of caregiving.
3. *The family caregivers' perceived stress level was measured using the Chinese version of the Perceived Stress Scale* (Leung et al., 2010), which (Cohen et al., 1983) contains 10 items rated on a 5-point Likert-type scale, from 0 (never) to 4 (very often). The PSS (Leung et al., 2010) showed acceptable levels of psychometric properties, including internal consistency, with a Cronbach's alpha of 0.85

TABLE 1 Outline of the home-based, multisensory cognitive stimulation programme and component of treatment fidelity

Part A outline of the programme			
Activities	Theme	Objectives	Contents
1	Smell and Touch (Dyadic aroma massage)	<ul style="list-style-type: none"> Stimulating the senses of smell and touch Teaching the basic skills of aroma massage Encouraging PWD-caregiver interactions 	<ul style="list-style-type: none"> Reality orientation Dyadic aroma massage Sharing and discussing one's feelings, successes and difficulties in performing the activities
2	Vision and Touch (Making handicrafts)	<ul style="list-style-type: none"> Stimulating the senses of smell and touch Promoting creativity and executive function Increasing the concentration and attention span Enhancing the collaboration of the PWD-caregiver dyad 	<ul style="list-style-type: none"> Reality orientation Making handicrafts Sharing and discussing one's feelings, successes and difficulties in performing the activities
3	Taste, Touch and Smell (Garnishing and tasting fruits and vegetables)	<ul style="list-style-type: none"> Stimulating the senses of taste, smell and touch Enhancing visual-spatial skills and executive function Enhancing the collaboration of the PWD-caregiver dyad 	<ul style="list-style-type: none"> Reality orientation Garnishing and tasting fruits and vegetables Sharing and discussing one's feelings, successes and difficulties in performing the activities
4	Vision and Touch (Horticulture)	<ul style="list-style-type: none"> Stimulating the senses of vision and touch Enhancing visual-spatial skills and executive function Enhancing the collaboration of the PWD-caregiver dyad 	<ul style="list-style-type: none"> Reality orientation Horticulture activity Sharing and discussing one's feelings, successes and difficulties in performing the activities
5	Hearing and Touch (Singing and dancing with musical instruments)	<ul style="list-style-type: none"> Stimulating the senses of hearing and touch Promoting reminiscences through songs Enhancing dual motor-cognitive tasks 	<ul style="list-style-type: none"> Reality orientation Singing and dancing with musical instruments Sharing and discussing one's feelings, successes and difficulties in performing the activities
6	Taste, Touch, and Smell (Making and tasting dumplings)	<ul style="list-style-type: none"> Stimulating the senses of taste, smell, and touch Enhancing visual-spatial skills and executive function Enhancing the collaboration of the PWD-caregiver dyad 	<ul style="list-style-type: none"> Reality orientation Making and tasting dumpling Sharing and discussing one's feelings, successes and difficulties in performing the activities
7	Hearing (Guessing songs and singing)	<ul style="list-style-type: none"> Stimulating the sense of hearing Promoting reminiscences through songs 	<ul style="list-style-type: none"> Reality orientation Guessing songs and singing Sharing and discussing one's feelings, successes and difficulties in performing the activities
8	Vision and Touch (Making photograph albums)	<ul style="list-style-type: none"> Stimulating the senses of vision and touch Enhancing visual-spatial skills and executive function Enhancing the collaboration of the PWD-caregiver dyad 	<ul style="list-style-type: none"> Reality orientation Making photograph albums Sharing and discussing one's feelings, successes and difficulties in performing the activities
Part B Component of Treatment Fidelity			
Component of treatment fidelity		Actions	
Training		<ul style="list-style-type: none"> Two training sessions (2 hours each) were provided by the healthcare professionals The training protocol, a manual with instructions, and equipment ('Five senses box') for delivering the intervention were provided to the caregivers Self-practice sessions were arranged between the two training sessions, which allowed the caregivers to report back on the challenges and difficulties that they had encountered, and to discuss the possible solutions 	
Delivery		<ul style="list-style-type: none"> A log booked was provided for the caregivers to record the duration of the intervention A weekly telephone follow-up was provided to answer the caregivers' questions 	
Receipt		<ul style="list-style-type: none"> The skills required to communicate with PWD and to manage behavioural problems during the intervention were taught in the training sessions. 	
Enactment		<ul style="list-style-type: none"> The 4F cycle (Facts, Feelings and Finding the future) was taught to the caregivers to encourage them to review and reflect on what they gained and understood after the intervention 	

and a test–retest reliability coefficient of 0.85 (Chu & Kao, 2005; Leung et al., 2010).

4. *The family caregivers' burden* was measured using the Chinese version of the Zarit Burden Interview (ZBI) (Chan et al., 2005) (Zarit et al., 1980). The ZBI is comprised of 22 items, including factors most frequently mentioned by caregivers as problem areas, such as the health, psychological well-being, finances and social life of the caregiver, and the relationship between the caregiver and the person with dementia. It was translated into Chinese in 2005, and was found to have a test–retest reliability of 0.99 and a split-half correlation coefficient of 0.81 (Chan et al., 2005).
5. *The family caregivers' quality of life* was assessed using the Chinese version of the World Health Organisation Quality of Life-brief (WHOQOL-brief) (Leung et al., 2005). It is comprised of 28 items, with each item being rated on a 5-point Likert-type scale ranging from 1 (very dissatisfied) to 5 (very satisfied), with a higher score indicating a better QoL. The internal consistency of the Hong Kong Chinese version of the WHOQOL has been confirmed to be satisfactory, with a Cronbach's alpha of from 0.73 in the environment domain to 0.83 in the psychological domain, and a test–retest reliability coefficient of 0.83 (Leung et al., 2005).
6. *The family caregivers' depressive symptoms* were measured using the Chinese version of the Center for Epidemiological Studies Depression Scale (CESDS) (Chin et al., 2015), which is a self-reported measure of depression that contains 20 items (Radloff, 1977). The CESD (Chin et al., 2015) showed acceptable levels of psychometric properties, including a test–retest reliability coefficient of 0.91 and an internal consistency coefficient for general depression of 0.86.
7. *The cognitive functions of the PWD* were assessed using the Montreal Cognitive Assessment 5-min protocol (MoCA-5-min). It is comprised of four domains, namely attention, executive function/language, orientation and memory. The MoCA-5-min was highly correlated with the MoCA administered face-to-face test ($r = .87, p < .001$). MoCA-5-min also had excellent test–retest reliability ($ICC = 0.89$) (Wong et al., 2009).
8. *The PWD's BPSD and related caregivers' distress* was measured using the Chinese version of the Neuropsychiatric Inventory-Questionnaire (NPI-Q). This tool is used to evaluate the frequency and severity of 12 neuropsychiatric symptoms and the related caregiver distress, by using a 5-point rating scale (Wong et al., 2014). The NPI-Q showed acceptable levels of psychometric properties, including high internal consistency, with a Cronbach's alpha of 0.76 and a test–retest reliability coefficient of 0.99 (Wong et al., 2014).

2.9 | Focus group

To explore the feasibility and acceptability of the HMCSP to PWD and caregivers, focus groups were conducted to identify the strengths, limitations, and difficulties of the HMCSP. Purposive sampling was adopted by selecting equal proportions of participants with different

rates of adherence to the HMCSP. The data collection process ended when data saturation was achieved, which was when no new information was discovered when analysing the data. Eventually, four focus groups were conducted, involving eight PWD-caregiver dyads.

2.10 | Data analysis

Data analysis was conducted using SPSS for Windows (version 24.0). Descriptive statistics were used to present the characteristics of the participants. The baseline outcome variables and socio-demographic characteristics of the HMCSP and control groups were compared using Fisher's exact test for categorical data and the Mann–Whitney U test for continuous data. Generalised estimating equations were adopted to examine the group effect (Intervention vs. Control), time effect (T0, T1, T2) and interaction effect (group x time) for the outcome measurements. Missing data were accommodated within the generalised estimating equations. The level of significance of all statistical tests was set at 0.05 (two-sided).

The four audio-recorded focus group interviews were transcribed for thematic analysis. Two researchers (Kor, Yu) independently read two subsamples of the transcripts to develop an initial coding framework that referred to the study objectives (perceived benefits and difficulties). The remaining transcripts were then coded independently. Through this process, the coding framework was revised, with the revision of new themes or existing themes. Disagreements over codes were resolved through discussions by the two independent researchers.

3 | RESULTS

3.1 | Characteristics of the participants

Seventy-two dyads of participants from four community centres joined the programme and were allocated to either the intervention group ($n = 36$) or the control group ($n = 36$). The study flowchart is presented in Figure 2. The demographic characteristics of the participants are summarised in Table 2. The mean age of the caregivers was 65.46 (SD = 14.72) and that of the PWD was 73.78 (SD = 4.97). The majority of the caregivers (55.56%) were the spouse of the care-recipients.

3.2 | Feasibility of the programme

It took 4 weeks to recruit the 72 dyads of participants from the four elderly centres. Of the 72 dyads found to be eligible to join the study, five dyads refused to join because of time constraints; thus the recruitment rate was 93.06%. The attendance rate of the face-to-face training sessions for the intervention group was 84.49% and the attrition rate was 5.56%. The average duration of the interventions delivered

by the family caregivers was 82.50 minutes (SD = 18.40) (ranging from 60–120 min) per week. Over 90% of the caregivers could follow the instructions to deliver the intervention three times a week. No harmful or adverse effects from practicing the intervention were found.

3.3 | Preliminary effects on the family caregivers

The results of the generalised estimating equation indicated that the family caregivers in the multisensory and cognitive stimulation programme group reported significantly greater improvements than those in the control group from baseline (T0) to immediately post-intervention (T1) in the positive aspect of caregiving (B = -6.56, 95% confidence interval [CI] = (-9.42, -3.70, $p = .002$), stress (B = 1.75, CI = 0.45, 3.06, $p < .009$), burden (B = 4.86, CI = 2.20, 7.52, $p < .001$) and QoL (B = -2.05, CI = -3.05, -1.05, $p < .001$). At the 3-month follow-up (T2), sustainable effects were demonstrated in the positive

aspect of caregiving (B = -2.14, CI = -3.76, -0.53, $p < .009$) and also in QoL (B = -1.59, CI = -2.40, -0.78, $p = .009$) (Table 3).

3.4 | Preliminary effects on the people with dementia

The results of the generalised estimating equation indicated that the PWD in the multisensory and cognitive stimulation programme group reported significantly greater improvements in their BPSD at T1 (immediately post-intervention) (B = 3.01, CI = 1.92, 4.10, $p < .001$) and T2 (3-month follow-up) (B = 1.81, CI = 0.54, 3.07, $p = .005$) than those in the control group, but no significantly greater improvement in overall cognitive function. In the sub-scale of the MoCA-5 min, the intervention group demonstrated significantly greater improvements in delayed memory at T1 (B = -0.99, CI = -1.82, -0.16, $p = .020$) and T2 (B = -0.85, CI = -1.52, -0.18, $p = .012$) than the control group (Table 3).

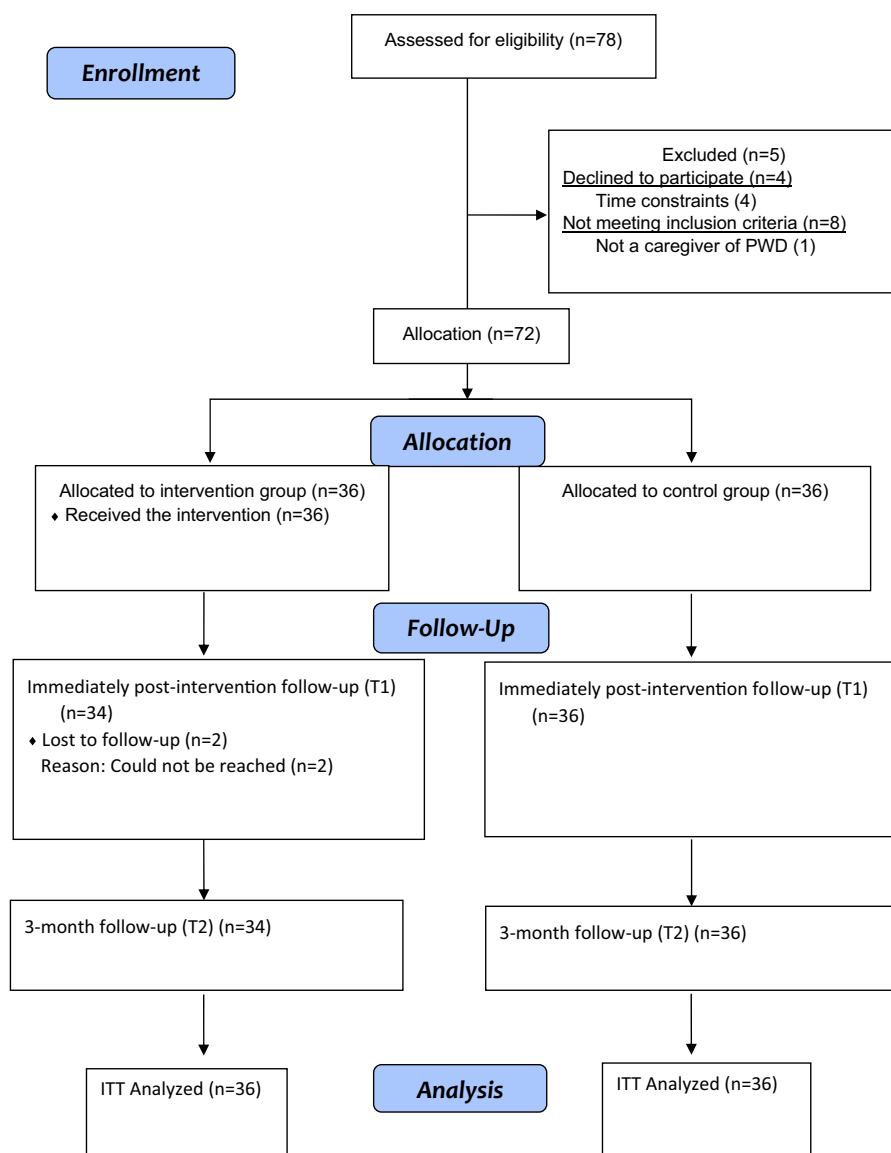


FIGURE 2 Study flow diagram

TABLE 2 Participant characteristics and outcome measurements at baseline (N = 144; 72 dyads)

Family caregivers	All (n = 72)	Intervention (n = 36)	Control (n = 36)	p value ^a
Demographic data				
Gender (%)				
Male	17 (23.61)	7 (19.44)	10 (27.78)	0.408
Female	55 (76.39)	29 (80.56)	26 (72.22)	
Age				
Mean (SD) (Range: 21–85)	65.46 (14.72)	70.14 (12.56)	60.92 (15.40)	0.391
Relationship with PWD, (%)				
Spouse	40 (55.56)	22 (61.11)	18 (50.00)	0.321
Son/daughter	24 (33.33)	12 (33.33)	12 (33.33)	
Grand-daughter/son	3 (4.17)	0 (0.00)	3 (8.33)	
Son/daughter-in-law	5 (6.94)	2 (5.56)	3 (8.33)	
Income per month (%) ^b				
Less than \$2000HKD	9 (12.50)	2 (5.56)	7 (19.44)	0.337
\$2000 - \$9999HKD	34 (47.22)	19 (52.78)	15 (41.67)	
\$10,000 - \$19,999HKD	19 (26.39)	9 (25.00)	10 (27.78)	
More than \$20,000HKD	10 (13.89)	6 (16.67)	4 (11.11)	
Education level (%)				
No schooling	7 (9.72)	3 (8.33)	4 (11.11)	0.755
Primary	23 (31.94)	13 (36.11)	9 (25.00)	
Secondary	23 (31.94)	10 (27.78)	13 (36.11)	
Tertiary or above	19 (26.39)	10 (27.78)	10 (27.78)	
Employment status (%)				
Employed	15 (20.83)	5 (13.89)	10 (27.78)	0.198
Retired	50 (69.44)	29 (80.56)	24 (66.67)	
Unemployed	4 (5.56)	2 (5.56)	2 (5.56)	
Duration of care (Month)				
Mean (SD) (Range: 8–240)	85.4 (107.12)	100.2 (135.81)	71.4 (69.42)	0.901
Outcome Measurements (Mean, SD)				
Perceived Stress Scale (Range: 14–36)	24.46 (4.93)	25.21 (4.37)	23.75 (5.37)	0.367
Zarit Burden Interview (Range: 10–67)	37.74 (11.91)	38.68 (12.08)	36.79 (11.84)	0.610
Positive Aspect of Caregiving (Range: 8–44)	33.27 (8.47)	32.85 (8.95)	33.67 (8.10)	0.791
Centre for Epidemiological Studies-Depression (Range: 1–46)	16.76 (9.13)	17.21 (9.00)	16.32 (9.36)	0.551
NPI-Q (Caregiver distress) (Range: 2–30)	11.00 (8.09)	11.59 (8.08)	10.41 (8.18)	0.556
WHO Quality of Life-BREF (Range: 4–20)	13.23 (2.97)	12.71 (3.26)	13.72 (2.62)	0.261
People with Dementia				
Demographic data				
Gender (%)				
Male	50 (69.44)	22 (61.12)	28 (77.82)	0.127
Female	22 (30.56)	14 (36.9)	8 (22.21)	
Age				
Mean (SD) (Range: 66–81)	73.78 (4.97)	73.53 (4.64)	74.00 (5.32)	0.250
Education level (%)				
No schooling	35 (48.61)	16 (44.44)	19 (52.78)	0.429
Primary	27 (37.50)	14 (38.89)	13 (36.11)	
Secondary	8 (11.11)	5 (13.89)	3 (8.33)	
Tertiary or above	2 (2.78)	1 (2.78)	1 (2.78)	

(Continues)

TABLE 2 (Continued)

People with Dementia				
Outcome Measurements (Mean, SD)				
MoCA-5-min (Range: 9–16)	11.35 (6.00)	11.58 (5.89)	11.12 (6.25)	0.823
Attention (Range: 1–4)	2.83 (1.87)	3.15 (1.74)	2.51 (1.96)	0.185
Verbal Fluency (Range: 2–5)	2.27 (1.80)	2.50 (2.15)	2.04 (1.38)	0.655
Orientation (Range: 2–6)	3.06 (1.96)	3.03 (1.87)	3.09 (2.08)	0.894
Delayed Memory (Range: 2–8)	3.15 (2.41)	2.91 (2.48)	3.37 (2.35)	0.335
NPI-Q	10.68 (6.04)	11.47 (5.65)	9.88 (6.39)	0.296

^aMann-Whitney's test or Chi-square was used.

^bUS\$1 = HK\$7.8.

3.5 | Focus group

Thirteen pairs of PWD-caregiver dyads were invited to join the focus group. The majority of the participants were the child ($n = 2$) or spouse ($n = 11$) of the care-recipient. Three themes emerged from the data. The findings are shown as follows, with details and examples given in Table 4:

3.5.1 | Impacts on the caregiving and dyadic relationship

A majority of the caregivers reported positive impacts on the caregiving and dyadic relationship after the intervention. These included an improved understanding of the person with dementia, increased insights on caregiving skills and improved interactions:

... If he cannot do it (the tasks in the intervention) successfully the first time and if you shout at him, he would just give it up and discontinue the activity. More patience is needed when taking care of him. You need to praise him more and encourage him. 'You did it very well! But you need to take some rest...

... I saw her become happier after playing the game with me; we have a better relationship. I am not just sitting at home, but can take some action to care for my mum....

3.5.2 | Impacts on the PWD

The caregivers also reported a significant impact on the person with dementia. Improved self-understanding about one's own capacities and strengths, positive emotions and active engagement, and remaining physically and cognitively active were found in the person with dementia:

... He became much happier than before. Before this, he rarely spoke. But his mood has greatly improved after attending the program. He is much happier now. It is good to know that he can still be happy even after he received the diagnosis of dementia....

3.5.3 | Barriers to implementing the programme

The caregivers reported a few barriers to implementing the programme. The major ones were the limited patience of the care-recipients, time constraints perceived by the caregivers and the poor motivation of the dyads:

... I asked him (PWD) to play. But he was reluctant.... He doesn't even want to walk. He only wants to sleep. So, to him, he does not seem to have learned anything from the programme....

... I sometimes feel guilty, but I really need to go to work. I cannot do the training all the time with my mother....

4 | DISCUSSIONS

This is one of the few studies to examine the feasibility and preliminary effects of a home-based multisensory and cognitive stimulation programme delivered to PWD by their family caregivers during the COVID-19 pandemic. Our findings suggested that HMCSP can feasibly be implemented, as reflected by the high completion rate, low attrition rate, absence of adverse events and positive feedback from interviews. There were also potentially positive effects on the caregiving experience, stress, burden and QoL of the family caregivers, and on the BPSD and delayed memory of the PWD. HMCSP can be potentially used as an alternative intervention during a pandemic when it is not feasible to carry out face-to-face group interventions.

5 | FEASIBILITY OF HMCSP

Compared with a similar study of a home-based caregiver-delivered cognitive stimulation intervention, in which only 40% of dyads completed at least 2 sessions/week and which had an attrition rate of 26% (Orrell et al., 2017), our programme reported better adherence and lower attrition, suggesting that HMCSP was more acceptable to caregivers when a shorter intervention duration was in place and additional support was provided (e.g. telephone follow-ups and the use

TABLE 3 GEE models for comparison of outcomes between the control and intervention groups across time

	Intervention group (n = 36)	Control group (n = 36)	Group effect		Time effect		Group X time	
	Mean (SD)	Mean (SD)	Beta (95% CI)	p value	Beta (95% CI)	p value	Beta (95% CI)	p value
PSS								
Baseline	25.21 (4.43)	23.75 (5.30)	-0.30 (-2.51, 1.91)	.792				
Post-test	24.76 (4.39)	24.50 (4.71)			-1.69 (-2.41, -0.98)	.001	1.75 (0.45, 3.06)	.009
3-month	25.15 (4.70)	25.44 (4.87)			-0.94 (-1.58, -0.31)	.004	0.56 (-0.52, 1.65)	.310
ZBI								
Baseline	38.68 (12.25)	36.38 (11.60)	-2.56 (-7.54, 2.41)	.313				
Post-test	36.76 (11.88)	37.95 (10.72)			-3.07 (-4.67, -1.46)	.001	4.86 (2.20, 7.52)	<.001
3-month	36.88 (11.55)	39.44 (9.93)			-1.50 (-2.49, -0.51)	.003	1.38 (-0.42, 3.18)	.133
PAC								
Baseline	32.85 (9.08)	33.67 (7.99)	3.86 (1.04, 6.69)	.007				
Post-test	35.41 (7.55)	31.81 (6.50)			1.47 (-0.08, 3.02)	.062	-6.56 (-9.42, -3.70)	<.001
3-month	37.94 (6.63)	32.19 (6.33)			-0.39 (-1.37, 0.60)	.439	-2.14 (-3.76, -0.53)	.009
CESD								
Baseline	17.92 (9.96)	16.50 (9.21)	1.50 (-2.67, 5.66)	.481				
Post-test	18.92 (10.24)	17.06 (7.32)			-1.03 (-2.71, 0.66)	.232	-0.08 (-2.63, 2.46)	.949
3-month	19.03 (10.14)	17.53 (7.72)			-0.46 (-1.60, 0.65)	.407	0.37 (-1.35, 2.09)	.674
QoL								
Baseline	12.71 (3.31)	13.72 (2.59)	1.03 (-0.11, 2.17)	.075				
Post-test	13.00 (3.09)	13.56 (2.36)			1.17 (0.49, 1.84)	.001	-2.05 (-3.05, -1.05)	<.001
3-month	13.59 (2.58)	12.56 (2.34)			1.00 (0.48, 1.52)	<.001	-1.59 (-2.40, -0.78)	<.001
NPI-Q_Caregiver distress								
Baseline	11.59 (8.19)	10.81 (8.29)	-0.35 (-3.77, 3.07)	.840				
Post-test	10.65 (7.43)	11.67 (8.24)			-0.19 (-1.43, 1.06)	.769	1.13 (-0.81, 3.07)	.254
3-month	10.65 (7.16)	11.00 (7.63)			0.67 (-0.28, 1.62)	.164	-0.67 (-2.10, 0.75)	.354
MOCA-5 mins								
Baseline	11.59 (5.88)	11.13 (6.16)	1.59 (-0.77, 3.94)	.187				
Post-test	11.82 (5.15)	11.40 (6.06)			0.65 (-0.37, 1.67)	.209	-1.12 (-2.43, 0.18)	.091
3-month	12.06 (5.21)	10.47 (4.99)			0.93 (-0.06, 1.92)	.065	-1.17 (-2.37, 0.04)	.059
Attention (sub-scale of MOCA-5 mins)								
Baseline	3.15 (1.77)	2.56 (1.95)	0.81 (0.03, 1.60)	.043				
Post-test	3.74 (1.64)	2.88 (1.75)			-0.12 (-0.40, 0.17)	.423	-0.23 (-0.81, 0.35)	.439
3-month	3.49 (1.64)	2.68 (1.77)			0.21 (-0.09, 0.50)	.170	0.04 (-0.43, 0.51)	.865
Verbal fluency (sub-scale of MOCA-5 mins)								
Baseline	2.50 (2.18)	2.04 (1.35)	0.72 (0.02, 1.43)	.044				
Post-test	2.66 (1.98)	2.11 (1.22)			0.02 (-0.28, 0.31)	.908	-0.26 (-0.65, 0.12)	.179
3-month	2.75 (1.88)	2.02 (1.06)			0.08 (-0.14, 0.31)	.470	-0.17 (-0.56, 0.23)	.402
Orientation (sub-scale of MOCA-5 mins)								
Baseline	3.03 (1.89)	3.11 (2.06)	0.07 (-0.82, 0.96)	.879				
Post-test	2.91 (1.53)	2.75 (1.65)			-0.03 (-0.29, 0.24)	.844	-0.15 (-0.61, 0.31)	.519
3-month	3.21 (1.99)	3.14 (1.84)			-0.39 (-0.77, -0.01)	.047	0.09 (-0.47, 0.64)	.755
Delayed memory (sub-scale of MOCA-5 mins)								
Baseline	2.91 (2.51)	3.39 (2.31)	0.51 (-0.47, 1.50)	0.308				
Post-test	2.97 (2.15)	3.31 (2.24)			0.41 (-0.17, 0.10)	.164	-0.99 (-1.82, -0.16)	.020
3-month	3.49 (2.35)	2.97 (1.89)			0.34 (-0.15, 0.82)	.172	-0.85 (-1.52, -0.18)	.012

(Continues)

TABLE 3 (Continued)

	Intervention group (n = 36)	Control group (n = 36)	Group effect		Time effect		Group X time	
	Mean (SD)	Mean (SD)	Beta (95% CI)	p value	Beta (95% CI)	p value	Beta (95% CI)	p value
NPIQ								
Baseline	11.47 (5.73)	10.18 (6.42)	-0.97 (-3.76, 1.82)	.495				
Post-test	8.82 (5.54)	10.53 (6.51)			-2.65 (-3.64, -1.66)	<.001	3.01 (1.92, 4.10)	<.001
3-month	9.85 (5.43)	10.36 (6.46)			-1.62 (-2.71, -0.53)	.004	1.81 (0.54, 3.07)	.005

Abbreviations: CESD, Center for Epidemiological Studies-Depression; MOCA-5 mins, Montreal Cognitive Assessment 5-minutes; NPIQ, Neuropsychiatric Inventory-Questionnaire; PAC, Positive aspect of caregiving; PSS, Perceived Stress Scale; ZBI, Zarit Burden Interview.

of an intervention manual). It is also interesting to note that when our intervention was compared with conventional centre-based interventions of similar content (Cove et al., 2014; Spector et al., 2003), HMCSP had a lower attrition rate. One explanation for this could be that a home-based intervention allows for a more flexible intervention schedule for caregivers, who are engaged in various caregiving tasks. In addition, implementing the intervention in a familiar living environment can give PWD a sense of security and comfort, which could potentially increase adherence to the intervention (Førsund et al., 2018).

Despite this, in our interviews suggested that there were several barriers to implementation. First, we found that the PWD's responses towards HMCSP varied according to their mental state. A few caregivers commented that their relatives showed a low level of patience and motivation throughout the sessions. As we observed that these responses mostly came from care-recipients who had more severe BPSD profiles, we speculated that HMCSP could be less acceptable to this subgroup. But this observation will require further investigation. Second, time constraints were reported to be another barrier, preventing family caregivers from delivering the sessions as intended. We suggested that prior to conducting HMCSP, clinicians should discuss with each caregiver concerns about their commitment so that more personalised support can be given throughout.

Family caregivers of PWD always engage in numerous caregiving tasks and taking up the role of delivering the HMCSP may further increase their burden. However, the high completion rate and low attrition rate are indications that caregiver-delivered interventions are highly acceptable to Chinese caregivers. In the Chinese culture, taking care of family members is regarded as a fundamental filial responsibility. In this qualitative study, a caregiver who could not regularly provide the training stated that 'I sometimes feel guilty, but I really need to go to work'. Some caregivers were also eager to do something to help their family member with dementia (e.g. 'I am not just sitting at home but I can take some action'). Since the HMCSP is embedded with the cultural value of filial piety through the adoption of the caregiver-delivered approach, this may explain the high levels of acceptability and adherence to the intervention among the Chinese caregivers. That the involvement of family caregivers in delivering the intervention was highly acceptable to the participants was also reported in other trials such in the stroke rehabilitation programme conducted in a Chinese rural area (Zhou et al., 2019). The

caregiver-delivered approach has the potential to be further promoted in Chinese communities.

5.1 | Preliminary efficacy of the HMCSP

We found that our programme was effective in enhancing the caregiving experience (more positive experiences and fewer negative experiences) and QoL of caregivers. One of our previous concerns about having family caregivers deliver the sessions was that this would impose an extra burden on them. However, similar to previous caregiver-delivered interventional studies, our HMCSP led to the improvements in the positive caregiving experience, stress and burden of the family caregivers (Orrell, 2017; Moon & Adams, 2012; Poon, 2019). This may have been due to the improvements in the caregivers' understanding of the care-recipients, their mutual communication, and the dyadic relationship, since conflicts between the caregivers and care-recipients were always related to miscommunication and to the making of inappropriate decisions due to insufficient mutual understanding (Cheng, 2017; Small et al., 2000). Moreover, a majority of family caregivers from our interviews reported improved insights about their caregiving skills. A caregiver shared the view that 'It is difficult to allow him (the PWD) to cook independently. But from the training, I know I can ask him to do the preparation part, like peeling the vegetables. This can train up his tactile sensations'. From our interview data, we observed a more flexible use of caregiving skills throughout the programme and more confidence of the part of caregivers in providing care for their relatives. Such changes may explain why the HMCSP was effective in improving the caregiving experience and well-being of the caregivers.

In our programme, we adopted a caregiver-delivered approach. The PWD and their caregivers went through different training activities together in the HMCSP, in which their relationship was no longer that of 'giver' and 'receiver' but of a dyad of 'partners'. Such a partnering approach could enhance their mutual understanding and communication, and the quality of their relationship (Moon & Adams, 2012). This beneficial effect is also aligned with our interview finding that the majority of the caregiver participants experienced 'improved understanding towards the people with dementia' and 'improved interactions within the dyads'. One of the caregivers shared the view that 'After the program, I realized that she likes to

TABLE 4 Results of the focus group interview

1. Theme: Impacts on the caregiving and dyadic relationship	
Categories	Quotations
Improved understanding of people with dementia	<p>L38 (C): I aware that my dad indeed knows how to sing. I also realised that he likes to sing, too!</p> <p>L224-230: After the programme, I realised that she likes to watch things.... Things like basketball competitions and Chinese opera singing.</p> <p>L79-82: I also realised that the others (PWD from other groups) can create their own designs. For example, they are very detail-oriented ... they would ensure everything is symmetrical.... Through these activities, I realised that people with dementia do indeed have many strengths</p>
Increased insight on caregiving skills	<p>L129: I would let her (domestic helper) know not to help him (PWD) do everything. She can assign him tasks that are safe for him (PWD). I encourage her to engage him by assigning him safe tasks to work on. It is not that he (PWD) is unwilling to do these tasks. It is whether we have allocated the right tasks for him to work on.</p> <p>Everything taught in the session can be easily integrated into our daily life. Last time, we learned how to make our own dumplings. This is something that we can do every day and get in touch every day. We can smell these things. In our everyday life, we can indeed get in touch with different types of smells. This triggers me to think about how we can further apply "five senses" in our everyday life. It is not difficult to integrate these things into our daily life</p> <p>For example, cooking. You know, sometimes it is difficult to allow him to cook independently. But you can ask him to do the preparation part. Like, peeling the vegetables. This can train up his sense of touch</p> <p>L337-343: Yes. I need to be more patient with him. If he cannot do it successfully the first time and if you shout at him, he would just give up and discontinue the activity. More patience is needed when taking care of him. You need to praise him more and encourage him. "You did it very well! But you need to take some rest"</p> <p>L239-242: I learned from the programme that I need to show him more care because there are many things that he does not understand. The most important thing is to show him more care and accompany him more often. I should spend more time walking with him</p>
Improved interactions within the dyads	<p>L74: I think we cooperate quite well when building up the "diver" together (an activity inside the intervention)!</p> <p>L204-214: He (PWD) enjoys planting while I enjoy observing them. I (Caregiver) never water the plants because I do not know how to water them well. Every plant that I watered would die (laughing). Therefore, he is the person who is responsible for doing the watering or controlling the quantity of water</p>
2. Theme: Impacts on the care recipients (PWD)	
Improved self-understanding (capacity and strengths)	<p>It is very simple. I can smell it.... I lost one third of my ability to smell, but I can still smell it</p> <p>L18-22 (PWD): The benefit is ... (getting myself engaged in) eating and tasting and hearing. Understanding my own condition. What is good and what is bad.... My hearing and vision are bad</p> <p>L74-77: The final work that we built looks pretty. Through the process, he knows he is still "useful." He gained some sense of achievement from the activity</p>
Positive emotions	L57-60: He (PWD) thinks this activity suits him He enjoys the activity a lot
Improved engagement in daily life	<p>He enjoys this programme a lot. He always feels as if the time has passed so quickly. He always looks forward to coming to the session. He puts on his shoes quickly to prepare to go out</p> <p>L104: I practiced five times a week. The singing one was fun. The songs that we come across in our everyday life are complex. My husband cannot follow the pace of those songs. But the songs taught in the session were much easier. He (PWD) sang those songs happily when we were back. We sang happily together at home</p> <p>L57-60: He became much happier than before. Before this, he rarely spoke. But his mood has greatly improved after attending the programme. He is much happier now. It is good to know that he can still be happy even after he got the diagnosis of dementia</p> <p>L37-38: There are many activities that the elders had never engaged in before. For example, the aroma session. These activities trained up our "five senses"</p>

(Continues)

TABLE 4 (Continued)

Maintain physical activeness	L35: It involves physical exercises and activities like singing L94-99: The clapping exercise.... He has always been reluctant to do the exercises. He used to say he was tired. However, he does exercise almost every day now. Five days per week. He follows 'this' and then does his exercises. He also plays the one ... about ... 'the ball'. This can train his flexibility ... heart and eyes ... basically everything about coordination. "Exercising can help him to slow down the deterioration
Improved cognition	The activity trains up our brain'. Touching things.... Of course, he was not that smart at the beginning. But he gradually improved (his senses) by touching different objects
Easy to incorporate the skills in daily life	L170: He is able to recognise an 'orange' because he has them at home sometimes. But he cannot smell fruits like lemons. I asked him the other day "What about this?" He said he did not know. And then I asked again. He answered me that these are oranges
3. Theme: Barriers to the implementation of the programme faced by the caregivers	
No patience	L38: He will become impatient when working on the tasks. He does not want to do them
Time constraints	L134-137: We rarely practice because we have a lot of things to work on. We need to clean up the dust at home
Poor motivation to initiate practice	L107: I asked him (PWD) to come. But he was reluctant.... He does not even want to walk. He only wants to sleep. So, to him, he does not seem to have learned anything from the programme L250-251: She (PWD) knows how to do it. But the thing is that she does not want to "move" at all. That is strange. She does not want to move.... Even when she was given a smartphone to play with (something that the PWD used to like), she said she did not want it L349-354: I did not really practice with him at home because he showed no interest in anything. And I do not have much energy to talk to him about this.... He basically has no interests at all...

watch stuff ... like basketball competitions and Chinese opera'. The pandemic and the lockdown have led to many PWD having limited access to formal social support services (e.g. daycare respite services) and to a change of workplace for caregivers (i.e. to working from home). This has added to the pressure felt by many Hong Kong family caregivers, as they were 'homebound' with the PWD in the same environment. Given that maintaining a healthy relationship between dyads is particularly important in a time of pandemic, our findings demonstrated the potential effects of HMCSP on the relationship between dyads. They also indicate that a further study should be conducted, with the relationship between the caregiver and care-recipient as the outcome variable, to confirm the effects of the HMCSP.

Despite the aforementioned positive effects, however, in our study, no improvement was found in the overall cognitive function of the PWD, which is consistent with the findings from the study of Orrell et al. (2017) in which a home-based cognitive stimulation therapy was adopted. Compared with traditional cognitive stimulation therapy, our HMCSP was conducted at home using a one-to-one approach, which limited engagement such social interactions as discussions and sharing with peers. Participation in social activities requires the use of different cognitive domains and is regarded as an active component in cognitive stimulation therapy (Woods et al., 2012). The lack of social interactions in the HMCSP may account for the negative results that were found in the overall cognitive function of the PWD. However, the HMCSP provides PWD with activities that stimulate their senses and cognitive domains. According to the neuroplasticity theory, such stimulation could lead

to the proliferation of neurons and compensate for cognitive decline (Hill et al., 2011). This could explain the positive effects that we found in the delayed memory of the PWD. To strengthen the effects of the HMCSP on the cognitive function of the PWD, a further study could be conducted involving the building of a group-based HMCSP using technology such as mobile apps or the Internet.

The outbreak of the pandemic taught us a lesson about the importance of developing non-pharmacological interventions that are flexible enough to adopt quickly when face-to-face interventions delivered by professional staff are not feasible (Inchausti et al., 2020). The restrictive measures implemented during the pandemic have led to the cancellation of many centre-based dementia activities, limiting the use of strategies (social interaction, stimulation and distraction) that are routinely used to manage dementia symptoms. This can potentially contribute to the worsening of BPSD and cognitive decline (Canevelli, 2020), which may exacerbate caregiving stress and impair the relationship between the dyads (Canevelli, 2020). Our home-based multi-sensory cognitive stimulation intervention was found to be feasible, and to be effective at improving the caregiving experience and well-being of caregivers, and at improving BPSD symptoms. We recommend the use of HMCSP as an alternative intervention during the pandemic when face-to-face group interventions cannot feasibly be carried out. Furthermore, the current professional workforce has failed to keep pace with the rapidly increasing cases of dementia in the world (Livingston et al., 2020). Shifting from a community-based to a home-based approach in delivering interventions to PWD is an alternative solution that could alleviate the pressure on the social resources available for dementia care.

6 | LIMITATIONS

It should be noted that this study has some limitations. The first limitation is the small size of the sample, which decreases the generalisability of the findings. Second, although we succeeded in obtaining a broad spectrum of views about the intervention by purposively selecting participants to be interviewed based on their adherence rate, we did not purposively select dyads who dropped out or those with different demographic characteristics to increase the diversity of our interview samples. The majority of our interviewees (84%) were spousal caregivers. It is possible that non-spousal caregivers (e.g. adult children of the care-recipients) might have different perceptions of the intervention's feasibility, acceptability, benefits and barriers because they might have a different caregiving experience (i.e. more time constraints, less familiarity with caregiving tasks). Lastly, convenience sampling was adopted to recruit the subjects for this pilot study, which may have led to a self-selection bias.

7 | CONCLUSIONS

This study enhances the body of knowledge about the use of a home-based caregiver-delivered multi-sensory cognitive stimulation programme for PWD-caregiver dyads. Our findings suggest that our programme is feasible, and that it is effective at improving the BPSD and delayed memory of PWD, as well as at improving the caregiving experience, stress, burden and QoL of caregivers. Such encouraging results highlight the potential utility of a home-based caregiver-delivered programme for community-dwelling PWD during the pandemic period. However, we also acknowledge that this pilot study has limitations, such as a small sample size and the fact that we did not conduct randomisation; therefore, we recommend that a large-scale RCT be conducted to better understand the effects of the programme.

AUTHOR CONTRIBUTIONS

All of the authors contributed significantly to the study and are in agreement with the content of the manuscript.

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CONFLICT OF INTEREST

The author(s) declare that they have no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICAL STATEMENTS

Ethics approval was obtained from the Hong Kong Polytechnic University. The research team complied with all of the requirements for a study involving human subjects as stated in the Declaration of Helsinki and subsequent updates (World Medical Association, 2013). Ethics considerations: Ethics approval for this study was obtained from the ethics committee of The Hong Kong Polytechnic University (reference number HSEARS20201228002). The research team complied with all of the requirements for a study involving human subjects as stated in the Declaration of Helsinki and subsequent updates. A data monitoring committee was formed to ensure the safety of the participants from any harm that might arise as a result of the intervention.

DISCLOSURE

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