


A Systematic Review of Horticultural Therapy's Influence on Chinese Older Adults' Psychosocial Wellbeing

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Abstract

Aim: This systematic review aims to evaluate changes in Chinese older adults' psychosocial wellbeing after receiving horticultural therapy, and examine existing evidence regarding horticultural therapy's effectiveness in a Chinese setting. **Method:** Intervention studies measuring relevant outcomes amongst older adults and conducted in China were identified from ASSIA, CIHAHL Plus, PsycINFO, EMBASE, MEDLINE, SCOPUS, Web of Science Core Collection and CNKI. Cochrane risk of bias assessment tools were used to appraise study quality. **Result:** 16 studies were selected, among which four were published in English and 12 in Chinese. Findings suggested that after receiving horticultural therapy, older adults' psychosocial wellbeing is generally improved, but causal relationships between improvements and horticulture therapy were less clear. **Conclusion:** Features of horticultural therapy conducted in China is with its cultural and social uniqueness. Existing evidence supports the post-intervention benefits on completion of horticultural therapies, but the limitations in programme design, sample representativeness and methodological robustness limited the quality of the evidence.

Keywords

nature connection, alternative therapy, healthy aging, cultural context, psychosocial wellbeing

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Introduction

Background

The global ageing trend has been accelerating during recent years (United Nations, 2019). As people live longer and healthier lives, increasing research interest has focused on activities that can improve the wellbeing of older adults. Horticultural activities, are popular and provide people opportunities to interact with nature, and have been examined for their therapeutic potential.

The therapeutic use of horticultural activities can be traced back to the early 20th century (Williams, 2012). Its underlying mechanism remains unclear, although several theories have been proposed to explain the potential benefits of engaging with nature including: Biophilia Theory (Wilson, 1984); Attention Restoration Theory (ART) (Kaplan & Kaplan, 1989; Kaplan, 1995); and Stress Reduction Theory (Ulrich et al., 1991). The term 'Horticultural Therapy (HT)' describes

programmes facilitated by horticultural therapists, using horticultural activities as the key elements and enhancing participants' wellbeing via the process (Williams, 2016). Reviews on existing literature have been conducted to evaluate the therapeutic potential of HT among older adults. However, though generally supported the health-promoting effects of HT on both institutionalised and community-dwelling older adults (e.g. Wang & MacMillan, 2013) on psychological, cognitive, and physical wellbeing, most existing reviews either focused on specific difficulties (Lu et al., 2020; Soga et al., 2017; Zhao et al., 2020), or included a more

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general range of nature-based interventions (Gagliardi & Piccinini, 2019; Kim & Shin, 2020; Tam et al., 2020; Vseteckova et al., 2020; Yeo et al., 2020). Reviews often fail to include research conducted in Eastern societies compared to studies in Western countries (Gagliardi & Piccinini, 2019; Soga et al., 2017). As between-culture diversities could impact people's acceptance of different HT components and have an influence on intervention effectiveness, findings based on Western contexts would not necessarily fit well with Eastern societies, therefore there is a need to review the evidence for HT programmes in Eastern societies, such as China.

Being under the influence of Eastern culture, the benefits of natural elements on people's wellbeing in both mental and spiritual aspects have been long recognised in traditional Chinese philosophy, such as Confucianism and Taoism, that emphasise and encourage human-nature harmonious relationships (Wang & Stringer, 2000; Yao & Yao, 2000). The long history of appreciating gardens and bonsais in China (Chen, 2009) also provides a mass basis for HT to be widely adopted. However, the concept of HT as a therapeutic method was only newly introduced in China (Li, 2000a, 2000b), and is still underdeveloped (Zhu et al., 2021) and no published reviews have yet specifically evaluated HT in a Chinese setting.

This systematic review aims to evaluate whether HT interventions conducted in China among older adults are associated with or result in improvements in wellbeing. HT's effectiveness on two wellbeing domains is examined, namely (a) personal psychological wellbeing, referring to ones abilities to sustain general positive affective states, to be satisfied with life and to function effectively (Deci & Ryan, 2008; Huppert, 2009) and (b) social wellbeing, referring to individuals' capabilities to make and maintain positive relationships with others (Keyes & Shapiro, 2004). This review includes self-efficacy (one's beliefs in their capacities to attain certain goals) (Bandura, 2010), psychological affects (mental states involving arousal feelings) (Barrett & Bliss-Moreau, 2009; Parkinson et al., 1996), subjective wellbeing (one's perceived life satisfaction) (APA, n.d.), mental health condition, social support (helpful interpersonal relationships derive from one's social network) (Friis, 2010) and social connectedness (the experience of belonging to a social relationship or network) (Lee & Robbins, 1995) to capture the commonly measured concepts within this two domains of wellbeing.

Review Questions

- i. Compared to before the intervention, do older people's personal psychological and social wellbeing improve after HT?
- ii. Are improvements in older participants' personal psychological and social wellbeing following HT greater than those in a randomised control group who do not receive HT?

Method

Design

This systematic review is conducted and reported followed a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach (Page et al., 2021). PROSPERO protocols and the Cochrane Database of systematic reviews were searched to ensure the originality of this review.

Eligibility Criteria

Articles were selected if they: (1) recruited Chinese older adults aged 60 and above; (2) conducted HT interventions (as defined below); (3) measured related outcomes in the psychological and social wellbeing domains (as specified above) pre- and post-intervention; (4) were conducted in China (including mainland, Hong Kong and Macau) and published in English or Chinese. Articles collecting only qualitative data or without published full-text available will be excluded.

As there is no officially recognised registration procedure for horticultural therapists in China, the adapted definition of HT (Li, 2000a) from the existing AHTA's definition is adopted to fit the Chinese context. Hands-on activities dealing with plants (cultivating fruits, vegetables and/or ornamental plants), were included as horticultural activities, and interventions where such activities were the main components were eligible to be included. Studies did not need presence of trained horticultural 'therapists' in order to be included.

Search Strategy

Searching terms were developed based on study eligibility criteria (Appendix A), outcomes of interest were identified including self-efficacy, quality of life (QoL), subjective wellbeing, life satisfaction, affects, happiness, depression, anxiety, social support and social connectedness. Databases searched comprised ASSIA, CINAHL Plus, PsycINFO, EMBASE, MEDLINE, SCOPUS, Web of Science Core Collection and CNKI. The latest systematic searching update was performed on 23rd September 2021.

Selection Process

EndNote X9 (EndNote Version X9, Clarivate Analytics, 2019) was used for reference management. Citations of articles including titles and abstracts identified from the systematic searching were reviewed for relevance by the first reviewer (PL), and 50% of identified citations was randomly selected by the second reviewer (JM) for verification. After the first stage of screening, reference lists of identified articles were scanned and checked to ensure no additional relevant articles were missing. Following the inspection of the abstracts and titles, papers identified as relevant were obtained in full and assessed thoroughly for eligibility.

Among studies identified as eligible, a sub-set of those involving randomised controlled trials (RCTs) was selected to address the second review question.

Data Extraction

Data extracted (Appendix B) included authors and publishing year, study design, study setting, sample description, intervention and comparator, outcomes measured, timepoints of measuring, data analyses results and key findings. Follow-up effects were also included if they had been measured.

Quality Assessment

All studies included for review question one were appraised using the Risk of Bias In Non-randomised Studies of Interventions (ROBINS-I) (Sterne et al., 2016), with outcome categories of low, moderate, serious, critical risk of bias, or no information (NI). For the second review question, the Revised Cochrane Risk of Bias Tools for Randomised Trials (ROB-2) (Jüni et al., 2016) was used to assess the risk of bias of the RCTs, with outcome categories of low, some concerns, or high risk of bias.

The quality assessments of all the included study were conducted independently by two reviewers and the results were compared. Discrepancies were settled through discussions and double-checking referring to the tools' guidance (Jüni et al., 2016; Sterne et al., 2016, 2019).

Results

Study Selection

After removing duplicates, 2648 articles identified in the initial search were screened for relevance, of which 114 records were deemed potentially relevant based on titles and abstracts and subsequently had their full text versions assessed for eligibility. Ultimately, 16 studies were included in this review, of which four (Hassan et al., 2018; Lai et al., 2018; Tse, 2010; Yang et al., 2021) were published in English and the remainder were published in Chinese. Studies excluded are listed with reasons for exclusion in Appendix C. The selection process of included studies is reported in a PRISMA flowchart (Figure 1).

Of the 16 studies included, nine were RCTs (see Table 1 for details), and are included in the sub-set of studies used to answer Review Question ii.

Study Characteristics

10 of the included studies focused on older adults experiencing clinical or pre-clinical health states (Table 1). With the exception of Lu's (2018) study (which provided no information on the sample size) a total of 960 participants were included in the other 15 studies with sample size ranging from

30 (Gu, 2016) to 135 (Wu, 2018). The database and web searching yield no further information for Lu's study (2018) and no response received after contacting the author.

Intervention characteristics varied among studies in multiple aspects, including programme settings, duration and frequency, and horticultural activities involved (Table 1). The majority of interventions lasted between two to 3 months (Gu, 2016; Lai et al., 2018; Li et al., 2020; Lu, 2018; Tse, 2010; Wang et al., 2020; Wei et al., 2020; Xiu & Li, 2006; Yang et al., 2021). Comparators used comprising active control conditions (i.e. introducing other intervention methods) (Hassan et al., 2018; Lai et al., 2018; Tse, 2010; Wang & Jiang, 2020) and passive control conditions, including treatments/caring as usual (Chen et al., 2018; Wang et al., 2020; Wu et al., 2018; Wu, 2018; Yang et al., 2021) and blank control (Li et al., 2020). Two studies compared therapeutic effects of different types of horticultural activities (Huang et al., 2020; Wei et al., 2020), and four studies adopted a single-group pre- and post-design (Chen et al., 2020; Gu, 2016; Lu, 2018; Xiu & Li, 2006).

Quality Assessment

Two reviewers assessed the studies' quality independently, and the original agreement on overall risk of bias classification was 81% for Review Question 1 and 78% for Review Question 2. After discussions referring to the guidance of ROBINS-I (Sterne et al., 2016) and ROB-2.0 (Sterne et al., 2019), a consensus of the overall risk of bias categorisation was reached and reported in Table 1.

Except for Li and colleagues' (2020), Huang et al. (2020) and Wang and Jiang's (2020) RCTs being rated as having overall at least 'Some concerns' of risk of bias, all the other RCTs had a 'Low' overall risk of bias. Except for Tse's (2010) study, the other non-RCTs all had a 'High' overall risk of bias, mainly due to their poor scores in outcomes measurement and selection of reported results (see Appendix D for details in quality assessment).

Effects of HT on Older Adults

Outcomes Measured. Quality of life (QoL) (Chen et al., 2018; Li et al., 2020; Wang & Jiang, 2020; Wei et al., 2020; Wu et al., 2018; Yang et al., 2021) was the most measured outcome, followed by subjective wellbeing (Chen et al., 2020; Huang et al., 2020; Lai et al., 2018; Wang et al., 2020; Wei et al., 2020) and positive and negative affect (Chen et al., 2020; Li et al., 2020; Lu, 2018; Wei et al., 2020; Xiu & Li, 2006), and then depression/depressive symptoms (Gu, 2016; Lai et al., 2018; Lu, 2018; Wang & Jiang, 2020). The other outcomes of interest were only measured in one or two included studies (see Table 1 for details).

Due to the lack of homogeneity of outcome measured and intervention programme structures, a meta-analysis was not appropriate, and the results were synthesised narratively.

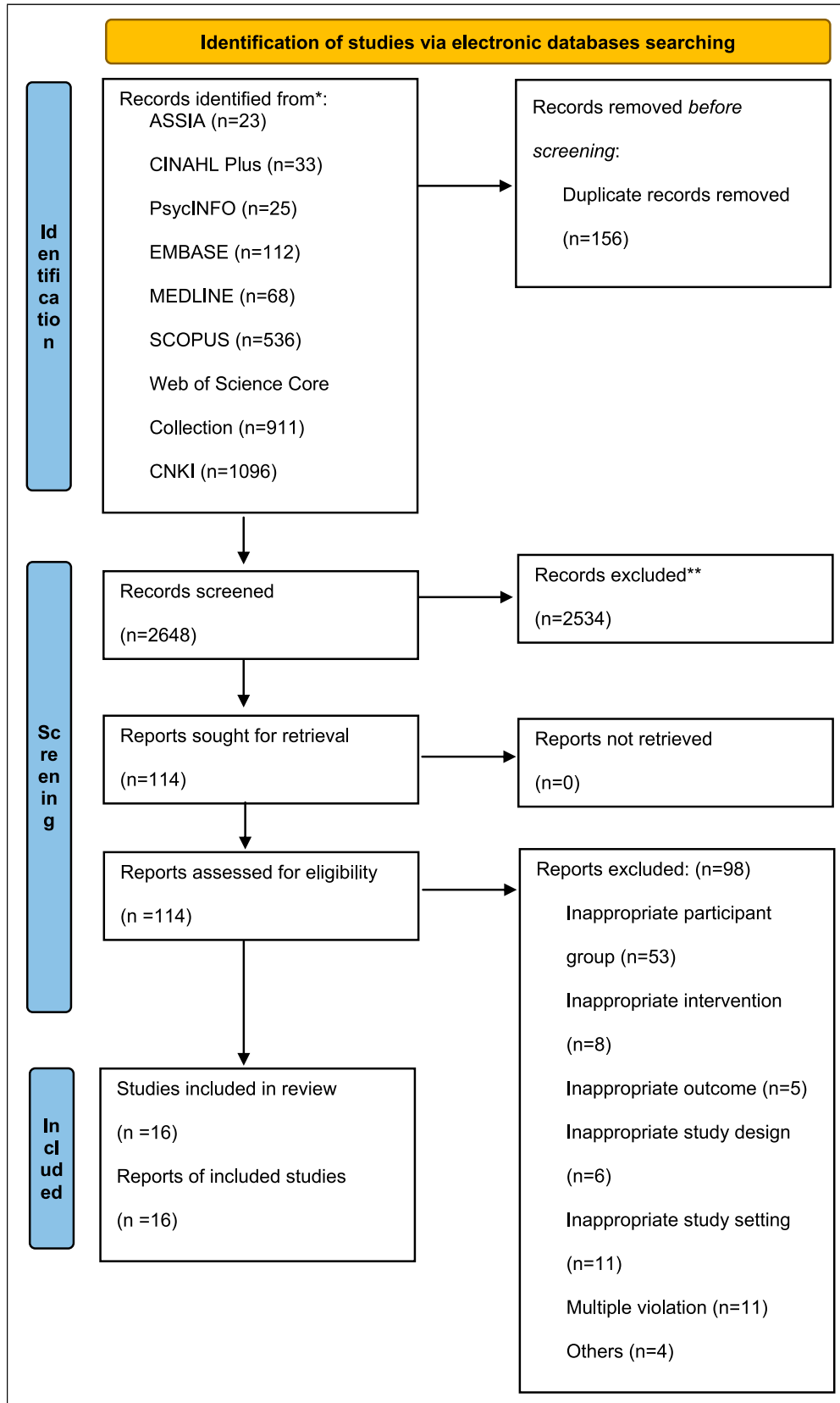


Figure 1. PRISMA flow diagram.

Table 1. Study Characteristics.

Study	Participant Description/Age (mean or range)	Sample size	Dose (Duration and Frequency)	Comparator	Outcome of interest (Measurement)	Quality Assessment	
						ROBINS-1	RoB 2
Non-RCTs							
Chen et al., 2020	Elderly nursing home residents/Aged above 60	32	30* Single session	—	Positive and negative affect** (PANAS**); face chart); Subjective Wellbeing (NES-E)	S	—
Gu, 2016	Elderly with depression symptoms (GDS scores above 15)/ Age range: 72–83	30	2*1 hour/ week*12 weeks	—	Depression** (GDS)	S	—
Lu, 2018	Older residents from a home-based care/Aged 65 or above	(NS)	1 hour/week*8 weeks	—	Positive and negative affect* (Mood chart); Depression* (GDS)	S	—
Tse, 2010	Older people living in nursing homes/ Mean age 84.1	53	Own-planting/ Weekly discussions/8 weeks	Weekly visits but no gardening programmes	Life satisfaction ** (LSIA); Social support ** (Lsns); Social connectedness ** (UCLA-L)	L	—
Wei et al., 2020	Elderly nursing home residents/Aged above 60	44	30'2 weeks * 8 weeks	—	Positive and negative affect** (pre-post A, B, D) (PANAS; face chart); Subjective wellbeing (SWBS-CC); Quality of life (SF-12)	S	—
Wu, 2018	Inpatients with psychological difficulties and dementia/Mean age 72.8	135	40'/week during hospitalisation	Routine care without HT	Anxiety** (SAS)	S	—
Xiu & Li, 2006	Elderly nursing home residents/Mean age 76.6	40	40'2 weeks*3 months	—	Positive and negative affect* (Mood chart);	S	—
RCTs							
Chen et al., 2018	Discharged Alzheimer's Disease patients/ Mean age 74.7	68	Two sessions/ week*8 months	Regular visits every 2 to 4 weeks	Quality of life** (QLI)	L	L
Hassan et al., 2018	Older women experiencing psychological stresses and depression/Mean age 79.5	40	15*single session	Transplanting without plants	Anxiety ** (STAI)	L	L
Huang et al., 2020	Elderly nursing home residents/Age range: 65–99	40	25*single session	—	Subjective Wellbeing (NES-E)	M	Sc
Lai et al., 2018	Frail and prefrail nursing home residents/Mean age 84.6	96	1 hour/week*8 weeks	Social activities in natural environment	Self-efficacy (GSES); Depression (GDS); Happiness ** (SHS); Perceived social support (Lsns); Subjective wellbeing (PWB);	L	L

(continued)

Table 1. (continued)

Study	Participant Description/Age (mean or range)	Sample size	Dose (Duration and Frequency)	Comparator	Outcome of interest (Measurement)	Quality Assessment	
						ROBINS-I	RoB 2
Li et al., 2020	Elderly nursing home residents with dementia/Mean age 81.3	34	30'2 weeks*8 weeks	Blank control	Positive and negative affect** (Face scale); Quality of life (SF-12)	M	Sc
Wang et al., 2020	Elderly nursing home residents/Mean age 83.4	60	1 hour/week*8 weeks	Routine care without HT	Subjective wellbeing** (GWB)	L	L
Wang & Jiang, 2020	Elderly depression in-patients/Mean age 68.3	126	1–2h per day during hospitalisation	Exercise therapy combined with usual care; 30/ per session) without HT	Depression** (GDS); Quality of life** (SF-36)	M	Sc
Wu et al., 2018	Mild-to moderate Alzheimer's Disease in-patients/Mean age 72.3	130	2*1 hour/week*6 months	Treatment as usual	Quality of life** (GQOL-74)	L	L
Yang et al., 2021	Alzheimer's Disease in-patients/Mean age 84.5	32	1 hour/week*10 weeks	Usual care activities	Quality of life** (QoL-AD)	L	L

I = institutional-dwelling; C = community-dwelling; PF = prefrail; F = frail; NS = not specify; L = Low risk of bias; M = Moderate risk of bias; S = Serious risk of bias; Sc = Some concerns of risk of bias.

PANAS = Positive and Negative Affect Schedule; SWBS-CC = Subjective Well-being Scale for Chinese Citizen; NES-E = Negative emotion scale for elderly; SSC: Social Skill Checklist; SAFE: Social-Adaptive Functioning Evaluation.

* (in Outcome) = Lack of information about the data analysis results in study publication.

** = Improvements were statistical significant (pre-post).

Review Question One: Changes in Wellbeing after Horticulture Therapy. Post-intervention increase in participants' QoL was measured in six studies (Table 1). Except for Li et al.'s (2020) and Wei et al.'s (2020) studies, all the other four studies reported significant post-HT improvements in QoL. Compared to the other studies, Li et al.'s and Wei et al.'s studies both adopted a lower frequencies and shorter programme duration of HT, making them the two studies with the lowest overall HT dosage among the six studies. Though seems to indicate a link between smaller HT dosages and lower levels of QoL improvements, the variance in participant characteristics should also be taken into account. All the four studies with significant post-HT improvements recruited elderly with mental difficulties (Wang & Jiang, 2020) or cognitive impairments (Chen et al., 2018; Wu et al., 2018; Yang et al., 2021), and the relatively lower baseline scores could make the levels of improvement more likely to be detected.

Older adults' subjective wellbeing and life satisfaction were measured in six studies (Table 1), but was only found significantly improved in Wang et al.'s RCT (2020) and Tse's non-RCT (2010). Both studies organised more sessions with longer programme durations compared to Chen et al.'s (2020), Huang et al.'s (2020) and Wei et al.'s (2020)

studies. When compared to Lai et al.'s (2018) study adopting a similar programme structure, Wang et al.'s and Tse's studies involved generally simpler horticultural activities (e.g. seed-picture making and daily tending), but activities used in Lai et al.'s study were likely to demand higher horticultural skills (e.g. trimming, repotting).

Post-HT changes in psychological effects were also measured in six studies and were all found increased, but were only reported with statistical significance in Lai et al.'s (2018) and Li et al.'s (2020) RCTs and Chen et al.'s single-group study (2020). Lu's (2018); Xiu & Li's (2006) studies yielded only narrative descriptions of mood improvements but no quantitative statistical analyses results. Slightly different from the other four studies, Wei et al.'s study (2020) separated four types of horticultural activities in different sessions, and found significant mood enhancements only in sowing, transplanting and herbal flowers potting activities, but not in succulents potting. Notably, generated from the two studies' findings comparing older adults' mood states pre-and post-session (Chen et al., 2020; Wei et al., 2020), the therapeutic potential of even a short period single session of horticultural activities was revealed. However, the generalisability of this finding is compromised as both studies recruited only elderly nursing home residents.

Depression/depressive symptoms were measured through the same measurement (GDS) in two RCTs (Lai et al., 2018; Wang & Jiang, 2020) and two single-group studies (Gu, 2016; Lu, 2018), but only Gu's (2016) and Wang and Jiang's (2020) studies found a statistically significant decrease in depression. Such discrepancies could be due to different baseline participants status, as Gu's (2016) and Wang and Jiang's (2020) studies recruited older adults with depression or depressive symptoms. Also, the higher overall HT dosage contained in Gu's (2016) and Wang and Jiang's (2020) studies than the other two studies could lead to the potential link between higher HT dosage and greater post-HT improvements.

Anxiety was measured in one RCT (Hassan et al., 2018) and one non-randomised controlled study (Wu, 2018). Both studies found significant decreases in participants' anxiety following the interventions. Hassan and colleagues (2018) performed the shortest HT programme (15 minutes) among all the 16 included studies, showing the therapeutic potential of short sessions of HT. Whilst Hassan et al.'s RCT had a low risk of bias, its generalisability is restricted by the single-gender composition (female only) and the relatively small sample size ($N = 40$). By contrast, Wu's (2018) study included 135 participants with a more balanced gender ratio, but the serious risk of bias of this study limited the strength of its findings.

Post-HT changes in participants' self-efficacy were measured only in Lai et al.'s study (2018). Older adults' self-efficacy enhanced after the 8-week HT programme, but the increase was not statistically significant. They completed the and reported with insignificant enhancement.

Only two included studies examined older adults' social wellbeing, measuring participants' perceived social support (Lai et al., 2018; Tse, 2010) and social connectedness (Tse, 2010). Both studies were conducted in Hong Kong and involved similar programme structures (Table 1). Older adults' perceived social support improved after completing the HT programme in both studies, but only in Tse's study (2010), such improvements were found significant. The intervention conducted in Tse's study (2010) was individual-based and participants were in charge of taking care of their plants, while participants in Lai et al.'s study (2018) completed group-based HT sessions and followed a pre-set protocol. Such variance in intervention design could lead to different levels of sense of control among participants, which might account for the inconsistencies in findings. Social connectedness was investigated only by Tse's study (2010). Significant post-HT reduction in loneliness was detected, which was also supported by post-intervention interviews conducted in the same study, in which participants expressed their pleasure in engaging in higher levels of social activities.

Review Question Two: Horticultural Therapy's effectiveness on Wellbeing. The evidence from the nine RCTs (Table 1) was reviewed to examine the causal effectiveness of HT's on older

adults' psychosocial improvement. As social connectedness were only measured in non-RCTs, HT's effects on these outcomes cannot be appraised.

HT's impacts on older adults' QoL were measured in five RCTs (Table 1) and were all reported with significant improvement, except for Li et al.'s (2020) study. Considering that Li et al.'s study scored low in the quality assessment due to its poor baseline control of participants and measuring process, while the other four studies recruited only elderly patients with depression or Alzheimer's Disease, conclusions can only be drawn on HT's beneficial effect on elderly Alzheimer's Disease patients, but not on the wider population.

HT's effect on participants' subjective wellbeing was tested in three RCTs (Huang et al., 2020; Lai et al., 2018; Wang et al., 2020) but was reported with significant group*time interaction effect only by Wang and colleagues. The three studies differed from each other in several aspects. Apart from the small dosage of HT for only 25 minutes contained in Huang et al.'s programme which might lead to insignificant results, the active control method (social activities in nature environment) adopted by Lai and colleagues could also reduce the likelihood of between-group difference to be detected, and thus potentially explain the insignificant findings.

HT's effect on older adults' depression/depressive symptoms was tested in Lai et al.'s (2018) and Wang and Jiang's (2020) RCTs but were only found a significant between-group difference in levels of reduction in Wang and Jiang's study. Apart from adopting a higher frequency of HT sessions on a daily basis, Wang and Jiang used a different comparator from Lai et al.'s study. Exercise therapy was applied in Wang and Jiang's control group, while Lai and colleagues organised social activities in natural surroundings as the comparator and thus might reduce the difference between the experimental and control conditions.

HT's effect on older adults' psychological affects was examined in two RCTs (Lai et al., 2018; Li et al., 2020), and were both reported significantly improved after the completion of programmes. However, as both studies recruited only elderly nursing home residents at clinical or pre-clinical health status, the external application of such findings to a wider population is under uncertainties.

Being measured only in Lai et al.'s RCT (2018), HT was not found to significantly increase older adults' self-efficacy and perceived social support. When it comes to HT's impacts on anxiety, Hassan and colleagues (2018) reported significant reducing effect with good quality of evidence, though the strength of evidence was compromised by the limited participant representativeness as stated in earlier sections. Hassan et al.'s study also appraised the variance in HT's therapeutic effectiveness of planting activities with and without plants. The significant between-tasks differences indicated that the involvement of living plants in an HT programme could bring greater improvements, and indicated

that living plants may be an active ingredient of HT interventions.

Only two studies tested the long-term effect of HT at three (Lai et al., 2018) and 4 months (Chen et al., 2018) after completion of the interventions, respectively. Both studies reported wellbeing enhancement at the time of measuring compared to baseline, but only in Chen et al.'s study the level of improvement remains significant in the follow-up measurement.

Discussion

To our knowledge, this is the first systematic review synthesising the evidence of HT's effectiveness on Chinese older adults' psychosocial wellbeing, bringing evidence from twelve studies published in Chinese to a wider international readership.

Regarding the two review questions, the evidence suggests that participating in HT programmes is beneficial and that HT has positive effects on older adults' psychosocial wellbeing. Stronger confidence can be put on evidence supporting HT's effects on enhancing older adults' life quality and reducing depression and anxiety. However, regarding HT's effects on the other outcomes of interest, evidence was either lack of external validity or with between-studies inconsistencies and therefore no solid conclusions can be drawn.

Limitations in the current research on HT in China is also disclosed. Most of the studies recruited only older adults with psychological or cognitive difficulties, while such a relatively narrow focus has left a research gap in HT's potential on the general non-clinical population under a Chinese circumstance. The lack of blinding in outcome measurements identified through study quality assessments also compromised the strength of evidence. Therefore, further studies including a wider population with more methodological rigour are needed, in order to strengthen relevant evidence when examining HT's effectiveness.

Moreover, in Lai et al.'s (2018) study, the comparator adopted was social activities in natural surroundings, and there were no significant between-group difference found. Notably, as suggested by the Biophilia (Wilson, 1984) and Stress Reduction (Ulrich et al., 1991) theories proposed to address HT's mechanism, the exposure to nature elements itself can benefit people's wellbeing. Social interaction is also considerably one component in many HT programmes and might bring extra effects, as supported by Kotozaki's study (2014) indicating the superiority of group-based HT compared to individual-based programmes. Therefore, the insignificant findings shall not be regarded as evidence against HT's effectiveness, but highlights the need for taking more consideration in control conditions used in future studies to reduce possibilities of having confounders.

This review also contributes to the potential mechanism underpinning differences in HT's effectiveness reported across studies. Higher session frequencies and HT dosage are

found to associate with higher levels of improvements, while activities that demand higher horticultural skills and knowledge might relate to smaller therapeutic effect. Such findings could support the ART pathway in explaining HT's mechanism, as shorter durations and longer intervals in-between could affect participants' emerging experience with natural elements and thus compromise HT's effects. Also, higher-demanding tasks could lead to higher perceived difficulties and reduce the attention restoration effect from engaging in horticultural activities. Such findings suggest the needs to understand the perspectives from potential user group of HT programmes in order to help the programme design and to choose components with an appropriate level of complexity of activities involved.

The high heterogeneity across studies, as also being noted in other previous reviews, (Clatworthy et al., 2013; Kamioka et al., 2014; Nicholas et al., 2019), has prevented a meta-analysis, and thereby a general effect size of HT's therapeutic potential on older adults' psychosocial wellbeing cannot be calculated. It is natural that the programme structures would depend heavily on site resources, such as the size of gardening space and local weather. However, more consideration should be given to specific site settings, and the impact of these on participants.

This review also reveals the cultural and social uniqueness of HT programmes conducted in China. Horticultural components adopted in HT in China are mostly light physical activities and require less space for operation (Appendix B). It is also common to see that many of the HT programmes conducted involved indoor pot-plantings and handicrafts-making but seldom gardens or planting areas (Huang et al., 2020; Li et al., 2020; Tse, 2010; Wang et al., 2020). This can reflect the adaptation of HT in China, and could be partially due to the high population density and limited land resources in city areas. As the therapeutic use of horticultural activities is relatively new in China (Li, 2000a, 2000b), future research on programme effectiveness and feasibility of different site settings are needed to support further localisation progress. In general, certain levels of flexibility can be allowed in the specific HT programme components, and the restricted accessibility of planting resources (e.g. garden plots, outdoor space) would not necessarily compromise programme efficacy, though impacts of participants' perception and acceptance on programme effectiveness might be worth to consider. However, the inconsistencies in studies' findings also emphasise the need to test effects of HT programmes with different features, as to provide insights for future feasibility and adaptability research.

Conclusion

This review synthesised HT studies conducted amongst the Chinese older adults, providing evidence of psychological and social wellbeing benefits of engaging in HT, and proposing potential mechanism underpinning that has

implications for the delivery and tailoring of HT programmes to the needs of Chinese older adults. However, questions remain about the optimal design of HT, such as the most effective dose (frequency and duration), the most effective components, and potential moderating factors that may affect efficacy. Further research is required to resolve these issues and to gather evidence of the perspectives of the elderly on their experiences of horticultural activities and HT programmes.

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Supplemental Material

Supplemental material for this article is available online.

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