Contents lists available at ScienceDirect

Integrative Medicine Research

Review Article

Mindfulness meditation program for the elderly in Korea: A preliminary review for planning the program

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ABSTRACT

Background: The significance of mindfulness meditation (MM) has increased in recent years in both clinical settings and public health. However, ways to implement MM as a disease prevention or treatment method in the elderly is still a major challenge. A comprehensive analysis of previous studies on MM programs for the elderly in Korea will help build future integrated care programs that incorporate MM.
Methods: Seven international and Korean domestic electronic databases were searched to collect relevant clinical studies until May 30, 2020.
Results: Sixteen articles with twelve clinical studies were included in this review. The MM program was generally offered once a week over eight weeks with a duration of between 60 and 90 min per session. The main reason for participants' drop out was poor program compliance attributed to conflicting schedules, physical illness, or a change of mind. The program results were either positive or mixed, but the mindfulness level of the participants was improved.
Conclusions: This review summarizes information obtained from previously published studies in Korea, on the design considerations, characteristics, and preliminary effectiveness of the MM program for the elderly. The findings can be used as preliminary data by future practitioners and/or researchers to design MM programs targeted toward the elderly; it could also help policymakers integrate MM-based strategies into integrated care programs to promote their mental health and well-being.

1. Introduction

Mindfulness can be described as an open and nonjudgmental intentional awareness of the experience of the present moment. Although meditation originates in Eastern traditional culture, the reason for its current widespread acceptance in modern medicine may be attributed to the standardization of meditation, especially that of mindfulness meditation (MM).[1] Ever since mindfulness-based stress reduction (MBSR) program that was developed by Jon Kabat-Zinn of Massachusetts university hospital was applied to stress and pain control in the late 1980s,[2,3] mindfulness-based interventions, including MM, have attained remarkable achievements both in the research field and in clinical practices. For instance, there is growing evidence that MM is an effective mind-body therapy for improving chronic pain.[4] As of 2012, more than two million US adults use MM, with 20–35% of them suffering from

pain conditions including low back pain, neck pain, or headache.[5] Further, in the management of intractable diseases such as cancer, meditation has been shown to improve the side effects of chemotherapy, stress, pain, and psychological well-being.[6–8] Interest in meditation has increased following a rise in the health issues of the elderly. Recent research has particularly addressed the effects of meditation on the activity of telomere, which is a biomarker of health and longevity thereby revealing the slowing effects of meditation on aging.[9,10] Additionally, the potential benefits of meditation for age-related cognitive decline, and physical and emotional well-being in the elderly have also been revealed.[11,12]

The unmet healthcare needs of the rapidly aging population are considered an important issue in the healthcare system of Korea.[13] The development of integrated care to address chronic diseases and aging-related health problems of this population is a major approach to solve these issues.[13] In fact, integrated medicine programs involving meditation are currently being implemented to improve the health status of the elderly and to prevent diseases around public health centers.[14] Since MM is a type of training that deals with an individual's internal experience, individual differences can occur and the adherence of the participant is likely to

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have a marked impact on its effectiveness. There is still a lack of awareness regarding the factors associated with MM compliance, but higher levels of education may predict higher compliance.[15] Additionally, personality traits and responses to stress rather than gender or age were reported as hindrances to meditation.[16] However, further research on MM compliance, which includes factors such as cultural contexts, accompanying physical or mental illnesses, senior citizens' welfare policies in their respective countries, and the way they are implemented (group or individual), is essential.

To date, there have been many reports of MM programs for the elderly in Korea, and a comprehensive analysis of these studies will help plan customized integrated care programs in the future that include MM. However, the characteristics of these programs including the characteristics of the participants, implementation methods, composition, duration, frequency of the MM program, outcome, and more importantly the major factors involved in program design for the Korean elderly have not yet been summarized. Cultural differences are a significant mediator of perceptions of aging in elderly,[17] and Asian cultures, including Korea, are more familiar with MM than Western cultures,[1] so to develop an optimized MM program for the elderly in Korea, it is necessary to synthesize and analyze the MM program previously implemented for the elderly in Korea. Therefore, this preliminary review was conducted to gather relevant clinical studies published in Korea and to summarize the essential considerations, which will help design MM programs for the elderly.

2. Methods

2.1. Data sources and search strategy

To collect the relevant clinical studies, three international electronic databases including MEDLINE (via PubMed), EMBASE (via Elsevier), and the Cochrane Central Register of Controlled Trials (CENTRAL), and four Korean domestic electronic databases including Korea Citation Index (KCI), Koreantudies Information Service System (KISS), National Digital Science Library (NDSL), and Research Information Service System (RISS) were searched with the keywords 'elderly' OR 'older' AND 'meditation' OR 'mindfulness' in English and Korean languages. Detailed search strategies for each database are given in Appendix I. The initial search date was January 15, 2020 and the update search was conducted on May 31, 2020. All studies published until the search date were considered. Further, the bibliography of references for the included articles was retrieved manually. Study search was performed by one author (CY Kwon).

2.2. Inclusion criteria and study selection

Clinical studies that had conducted MM-based programs for the Korean elderly (mean age of participants ≥60) reporting the effectiveness by using quantitative evaluation tool were included. However, mindfulness-based cognitive therapy and acceptance and commitment therapy that requires professional intervention by a skilled practitioner, meditation methods other than MM (such as mantra meditation, transcendental meditation, and dance meditation), yoga-based interventions, and other complex programs where MM is not a major component were excluded. There were no restrictions on the participants' clinical condition, gender, delivery methods, or design of study. Study selection was performed by one author (CY Kwon).

2.3. Data extraction

The following data were extracted from the included studies: the characteristics of the participants; implementation methods (by group or individually); composition, duration, and frequency of the MM program; outcome, main results; and authors' suggestions regarding major considerations involved in program design for the Korean elderly. Data extraction was performed by one author (CY Kwon).

2.4. Data analysis

All the included studies were described in a descriptive manner. The following three items were of major interest: characteristics of MM program for the Korean elderly, reported effectiveness, and considerations in the MM program design for this population.

3. Results

3.1. Characteristics of the included studies

Of the 276 papers obtained from the initial search after excluding the duplicates, 16 articles with 12 clinical studies were included in this review (Fig. 1),[18–33] which included four clinical studies that were published in both the dissertation and journal articles.[21–24,27,29,30,32] All the included studies were published between 2006 and 2018. Among them, two studies[20,24,27] were before-after studies and the remaining 10 studies[18,19,21–23,25,26,28–33] were non-randomized controlled trials (NRCTs). Sample sizes varied from six to 86. In six studies,[19,21,22,25,29,30,32,33] the number of enrolled participants was different from the number of analyzed participants because of various reasons including participant withdrawal. Five studies[18,20,26,28,33] were conducted specifically on elderly women, while the other studies[19,21–25,27,29–32] did not distinguish based on gender. With the exception of studies involving elderly women who had experienced the loss of their spouse[28] and elderly women with chronic pain conditions,[33] the rest of the studies had no limitations on either psychosocial or clinical status. Among the 10 NRCTs,[18,19,21–23,25,26,28–33] control group intervention of nine was wait-list,[18,19,21–23,25,26,28–32] while of the other one was general senior university lecture.[33] Five studies used the program outcomes to assess mindfulness.[19,20,24,27,29,32,33] Four studies assessed the depression[19,25,29,32,33] or stress[19,23,24,27,29,30,32] levels; two studies examined biomarkers such as rest heart rate, blood pressure and/or saliva cortisol;[18,23,30] the other two studies conducted blood tests to measure blood glucose, insulin, β-amyloid, brain-derived neurotrophic factor (BDNF), dehydroepiandrosterone sulfate (DHEAs), and/or heart rate variability (HRV);[18,31] and the other study assessed oversensitivity.[29,32] Additionally, there were two studies conducted with electroencephalography (EEG).[26,28] The study on elderly women with chronic pain conditions evaluated pain intensity and pain catastrophizing (Table 1).[33]

3.2. Characteristics of the MM program

All the MM programs were conducted as group participation programs. Six studies presented information that indicated the practitioner's expertise.[19,23–25,27,29,30,32,33] Except for the study by Kim,[31] which had walking meditation program, the rest of the studies used a combination of two or more meditations such as body scan, breathing meditation, and sitting meditation. Except for Park,[18] which had sitting meditation and breathing meditation, all the MM programs included physical components such as walking meditation, physical meditation, or hatha yoga. Jung[21,22] applied

Table 1
Characteristics of Included Studies of Mindfulness Meditation Program

1st author (year)	Design	Population (n) enrolled → analyzed	Intervention	Outcomes and Results (favorable for bolding group)	Meditation program and practitioner's experience (its period, duration and frequency)
Park (2006)[18]	NRCT	Elderly women TG: 30 → 30 (79.2 ± 1.9 year) CG: 30 → 30 (78.5 ± 3.7 year)	TG: Zen meditation CG: Wait-list	1. Rest heart rate: **TG** < CG ($p < 0.01$) 2. Blood pressure: systole, **TG** < CG ($p < 0.01$); diastole, no significant difference ($p > 0.05$) 3. Blood glucose: **TG** < CG ($p < 0.01$)	Sitting meditation and breathing meditation (1 week, 60 min * 5 time/week)
Kim (2008)[19]	NRCT	Senior-citizen center TG: 23 → 16 (72 year) CG: 18 → 17 (68 year) (physical illness (2), did not meet the entire course (6))	TG: Mindfulness meditation program CG: Wait-list	1. The Kentucky Inventory of Mindfulness Skills–observing subscale: **TG** > CG ($p < 0.01$) 2. Stress scale (Lee, 1999): **TG** < CG ($p < 0.01$) 3. The Center for Epidemiologic Studies Depression Scale: **TG** < CG ($p < 0.01$) 4. The Satisfaction with Life Scale: **TG** > CG ($p < 0.05$)	Session 1: Orientation Session 2: Mindfulness meditation (body scan) Session 3: Mindfulness meditation (body scan) Session 4: Mindfulness meditation (yoga) Session 5: Mindfulness meditation (yoga) Session 6: Mindfulness meditation (breathing meditation) Session 7: Mindfulness meditation (breathing meditation) (7 weeks, 1 hour * 1 time/week) by expert meditation healing
Jang (2009)[20]	before-after study	Elderly women 6 → 6 (NR)	Yum-Zi-Guan meditation	1. The Mindful Attention Awareness Scale: In pre- and post- comparison, **awareness** has increased from 62.39% to 69%. In the subcategory, **mindfulness on automatic pilot, preoccupation and inattention**, especially on inattention, have been markedly improved. In the six subdomain categories, **mindfulness on cognitive and body areas** increased significantly, on emotions and interpersonal relationships remained unchanged, and on general areas decreased slightly. In particular, a marked change in mindfulness on body area was observed.	Session 1–4: The experience of this moment Session 5–8 Acceptance and awareness All sessions included breathing meditation and feeling meditation. The breathing meditation included not only breathing meditation using numbers and images, but also performing meditation with physical movements (i.e. walking and jumping in place). The feeling meditation included meditation with the five senses (hearing: clapping, sight: mindful observing and following the other person, tactile: observing how the soles of the feet touch the ground or where they come in contact with the other person, taste: eating meditation), running meditation, body scan, and yoga. (8 weeks, 90 min * 1 time/week)
Jung* (2011)[21,22]	NRCT	Elderly college TG: 30 → 17 (77.06 ± 6.75 year) CG: 30 → 16 (73.31 ± 4.87 year) (receiving medical treatment at same time (3), going to the sons and daughter's home (2), going to swim at same time (2), caring grandchild (2), having difficulty in walking because of hurt legs (1), receiving another class (1), traveling with friends (2))	TG: Restructured MBSR program CG: Wait-list	1. The General Health Questionnaire-28: Mental health: **TG** > CG ($p < 0.001$) In pre- and post- comparison, TG showed significant improvement on **physical symptom** ($p = 0.048$) and **social activity** ($p < 0.001$), but not on anxiety ($p = 0.373$) and insomnia ($p = 0.394$). CG showed significant improvement on physical symptom ($p = 0.014$), but not on anxiety ($p = 0.379$), social activity ($p = 0.180$), and insomnia ($p = 1.000$).	Session 1: Orientation, meeting (breathing meditation) Session 2–3: Understandings of mind and body (walking meditation) Session 4–5: Looking at (eating meditation) Session 6–7: Good relationship (conversation meditation) Session 8–9: Doing love (physical meditation) Session 10–11: We are one (music meditation) Session 12: Wrap it up (breathing meditation) (12 weeks, 1 hour * 1 time/week)
Kim (2014)[25]	NRCT	Senior welfare center TG: 30 → 30 CG: 30 → 26 (82.51 year for all participants) (discharge from the center (2), refused to participate in the study (2))	TG: Mindfulness meditation program CG: Wait-list	1. Sleep scale (Oh, 1998): **TG** > CG ($p < 0.001$) 2. Elderly depression scale (Song, 1991): no significant difference ($p = 0.768$) 3. Quality of life scale (Choe, 1998): **TG** > CG ($p < 0.001$)	Session 1: Awareness of mind moving with autopilot (eating meditation) Session 2: Recognizing that the mind and body are one (breathing meditation, walking meditation) Session 3: Awareness of the inside of the body (body scan) Session 4: Focus attention on current feelings and thoughts (breathing meditation) Session 5: Awareness of conscious sensory (walking meditation) Session 6: Discover own original self (sitting meditation) Session 7: Awareness in everyday life (sitting meditation) Session 8: Expressing and observing the anger or hatred in own heart in proper ways (loving kindness meditation, forgiving meditation) (8 weeks, 90 min * 1 time/week) by mindfulness meditation expert

Table 1 (*Continued*)

1st author (year)	Design	Population (*n*) enrolled → analyzed	Intervention	Outcomes and Results (favorable for bolding group)	Meditation program and practitioner's experience (its period, duration and frequency)
Kim (2015)[26]	NRCT	Elderly women TG: 30 → 30 (80 year) CG: 30 → 30 (80 year)	TG: Mindfulness based breathing and body scan CG: Wait-list	1. Attention Quotient in EEG: Left, no significant difference ($p = 0.060$); Right, **TG** > CG ($p = 0.024$) Attention Quotient Rate in EEG: Left, **TG** < CG ($p = 0.037$); Right, **TG** < CG ($p = 0.019$) Note. The Activity Quotient shows attentive concentration and awareness in the brain, while the Activity Quotient Rate shows theta (sleep state and unconscious state) to sensorimotor rhythm wave (attention and activation) ratio.	Session 1–2: Rapport (orientation, introduction of breath) Session 3–4: Body awareness (mindfulness and body scan, relax of pelvic area) Session 5–8: Catharsis (mindfulness and body scan, relax of back, improvisation) Session 9–11: Expression (mindfulness and body scan, improvisation, relax of leg and foot) Session 12–14: Relation (mindfulness and body scan, relax of shoulder, improvisation) Session 15–16: Wholeness & Harmony (mindfulness and body scan, improvisation, closing remark) (16 weeks, 60 min * 1 time/week)
Yoo* (2016)[23,30]	NRCT	Senior welfare center TG: 36 → 35 (82.03 ± 4.64 year) CG: 36 → 34 (83.38 ± 6.81 year) (withdrew (2), hospitalization (1))	TG: MBSR program CG: Wait-list	1. Blood pressure: no significant difference ($p = 0.063$ and 0.503 for systole and diastole blood pressure, respectively) 2. Pulse: no significant difference ($p = 0.705$) 3. Saliva cortisol: **TG** < CG ($p = 0.003$) 4. Stress response scale (Koh, 2000): no significant difference ($p = 0.267$)	Session 1: Becoming aware of the automatic-controlled mind (eating meditation, body scan) Session 2: Awareness of mind and body to become one (breathing meditation, walking meditation) Session 3: Becoming aware of one's interior (hatha yoga) Session 4: Placing attention on the current feeling and thought (sitting meditation(1)) Session 5: Becoming aware of cognitive function (sitting meditation(2)) Session 6: Finding out essential ego (meditation day) Session 7: Awareness in daily life (sitting meditation, hatha yoga, body scan) Session 8: Putting the program in practice (loving kindness meditation, drawing up of meditation methods) (8 weeks, 90 min * 1 time/week) by member of the Korean Society for Meditation
Kim (2016)[28]	NRCT	Elderly women who experienced loss of spouse TG: 30 → 30 (70 ± 5 year) CG: 30 → 30 (70 ± 5 year)	TG: MBSR program CG: Wait-list	1. Activity Quotient in EEG: Left, no significant difference ($p = 0.072$); Right, **TG** > CG ($p = 0.013$) AntiStress Quotient in EEG: Left, **TG** < CG ($p = 0.050$); Right, no significant difference ($p = 0.156$) Note. The Activity Quotient shows the mental function and behavior tendency in the brain, while the AntiStress Quotient shows the state of physical and mental relaxation.	Session 1–2: Rapport (orientation, introduction of mindfulness and compassion meditation) Session 3–4: Body awareness (mindfulness and compassion meditation, relax of pelvic area) Session 5–8: Catharsis (mindfulness and compassion meditation, relax of back, improvisation) Session 9–11: Expression (mindfulness and compassion meditation, improvisation, relax of leg and foot) Session 12–14: Relation (mindfulness and compassion meditation, relax of shoulder, improvisation) Session 15–16: Wholeness & Harmony (mindfulness and compassion meditation, improvisation, closing remark) (16 weeks, 60 min * 1 time/week)

Table 1 (*Continued*)

1st author (year)	Design	Population (*n*) enrolled → analyzed	Intervention	Outcomes and Results (favorable for bolding group)	Meditation program and practitioner's experience (its period, duration and frequency)
Eum* (2016)[24,27]	before-after study	Senior welfare center 20 → 20 (NR)	Mindfulness training program	1. The Kentucky Inventory of Mindfulness Skills: In pre- and post- comparison, the group showed no significant change on attention control ($p = 0.813$) and careful action ($p = 0.330$). 2. Elderly stress scale (Yoo, 2011; Yoon, 2012): In pre- and post- comparison, the group showed significant improvement on **stress on economic power** ($p = 0.015$), **family** ($p = 0.004$), and **ability** ($p = 032$), but not on health ($p = 0.370$). 3. Life satisfaction scale (Choi, 2002; Hong, 2002): In pre- and post- comparison, the group showed significant improvement on **value of life** ($p < 0.001$), but not on life satisfaction ($p = 0.057$) and comfortable life ($p = 0.849$).	Session 1: Program structure, understanding through education, and identifying the desired attitude of mindfulness (body scan) Session 2: Awareness of one's physical senses, tension and relaxation (walking meditation) Session 3: Attention and awareness (eating meditation) Session 4: Attention and awareness (breathing meditation) Session 5: Love yourself, positive mind, and generous heart (loving-kindness meditation, forgiving meditation) Session 6: Attention and mindfulness to the senses by sending consciousness throughout the body (body scan) Session 7: Positive conscious experiences and awareness of self and external beings (walking meditation, loving-kindness meditation, forgiving meditation) Session 8: Share own feelings and impressions. (walking meditation) (8 weeks, 80 min * 1 time/week) by the researchers completed MBSR specialist course, mindfulness leadership course, mindfulness meditation practice and dialectical behavior therapy programs.
Kim (2017)[31]	NRCT	Elderly TG: 15 → 15 (67.18 ± 1.35 year) CG: 15 → 15 (66.80 ± 1.69 year)	TG: Walking meditation program CG: Wait-list	1. HRV: TP, **TG** > CG ($p < 0.001$); HF, **TG** < CG ($p < 0.05$); LF, **TG** > CG ($p < 0.001$); LF/HF ratio, **TG** < CG ($p < 0.001$) 2. K-MMSE: **TG** > CG ($p < 0.001$) Blood test (Insulin, β-amyloid, BDNF, DHEAs): Insulin, **TG** < CG ($p < 0.001$); β-amyloid, **TG** < CG ($p < 0.001$); BDNF, **TG** > CG ($p < 0.001$); DHEAs, **TG** > CG ($p < 0.001$)	Session 1: To know the need for meditation Session 2: Method of meditation and breathing, walking meditation to know Session 3–4: Meditation also listen to music and walking meditation Session 5–6: To physical fitness and walking meditation Session 7: Bean bag on his head and walking meditation Session 8: Meditation to walk along a line Session 9: Meditation to walk free in the auditorium Session 10–11: I take a walk, walking meditation Session 12: Explore what transformed (12 weeks, 50 min * 3 time/week)
Park* (2017)[29,32]	NRCT	Senior welfare center TG: 14 → 12 (NR) CG: 10 → 10 (NR) (physical pain (1), personal reason (1))	TG: Brief MBSR program CG: Wait-list	1. Observing subscale of Korean Version of Five Facet Mindfulness Questionnaire: **TG** > CG ($p < 0.01$) 2. Noticing and mind-body connection awareness subscales of Korean Multidimensional Assessment of Interoceptive Awareness: Noticing: **TG** > CG ($p < 0.001$) 3. Korean Version of the Perceived Stress Scale: **TG** < CG ($p < 0.01$) 4. Korean Form of Geriatric. Depression Scale: **TG** < CG ($p < 0.01$) 5. Oversensitivity subscale of Korean Elderly's Anxiety Scale: **TG** < CG ($p < 0.05$) Satisfaction with Life Scale: **TG** > CG ($p < 0.01$)	Session 1: Understanding mindfulness meditation (eating meditation, body scan, breathing meditation) Session 2: Awareness through body and sensation (hatha yoga, sitting meditation, body scan) Session 3: Awareness of automated reaction and response (walking meditation, sitting meditation, body scan) Session 4: Mindfulness in daily life (mountain meditation, loving kindness meditation, forgiving meditation) (4 weeks, 120 min * 1 time/week) by mindfulness meditation expert
Sim (2018)[33]	NRCT	Elderly women with chronic pain condition in elderly college TG: 38 → 22 (77.82 ± 4.21 year) CG: 48 → 21 (78.38 ± 5.95 year) (participants without chronic pain (9), not participated in the program more than twice (unclear), missing values in outcome (unclear), male participants (unclear))	TG: K-MBSR CG: General senior university lecture	1. Mindfulness scale (Park, 2006): **TG** > CG ($p < 0.001$) 2. Pain intensity (NRS): **TG** < CG ($p < 0.001$) 3. The Pain Catastrophizing Scale: **TG** < CG ($p < 0.001$) The Geriatric Depression Scale Short Form: **TG** < CG ($p < 0.001$)	Session 1: Eating meditation/body scan Session 2: Body scan/walking meditation Session 3: Mindfulness yoga/sitting meditation1 Session 4: Breathing meditation/psychoeducation1 Session 5: Body scan/sitting meditation2 Session 6: Mindfulness yoga/sitting meditation1 Session 7: Body scan/psychoeducation2 Session 8: Breathing meditation/finding own meditation (8 weeks, 120 min * 1 time/week) by member of the Korean Society for Meditation, who is an expert of meditation guidance

BDNF, brain-derived neurotrophic factor; CG, control group; DHEAs, dehydroepiandrosterone sulfate; EEG, electroencephalography; HRV, heart rate variability; K-MMSE, Korean version of Mini-Mental State Exam; MBSR, mindfulness-based stress reduction; NA, not applicable; NR, not reported; NRCT, non-randomized controlled trial; NRS, numerical rating scale; TG, treatment group.

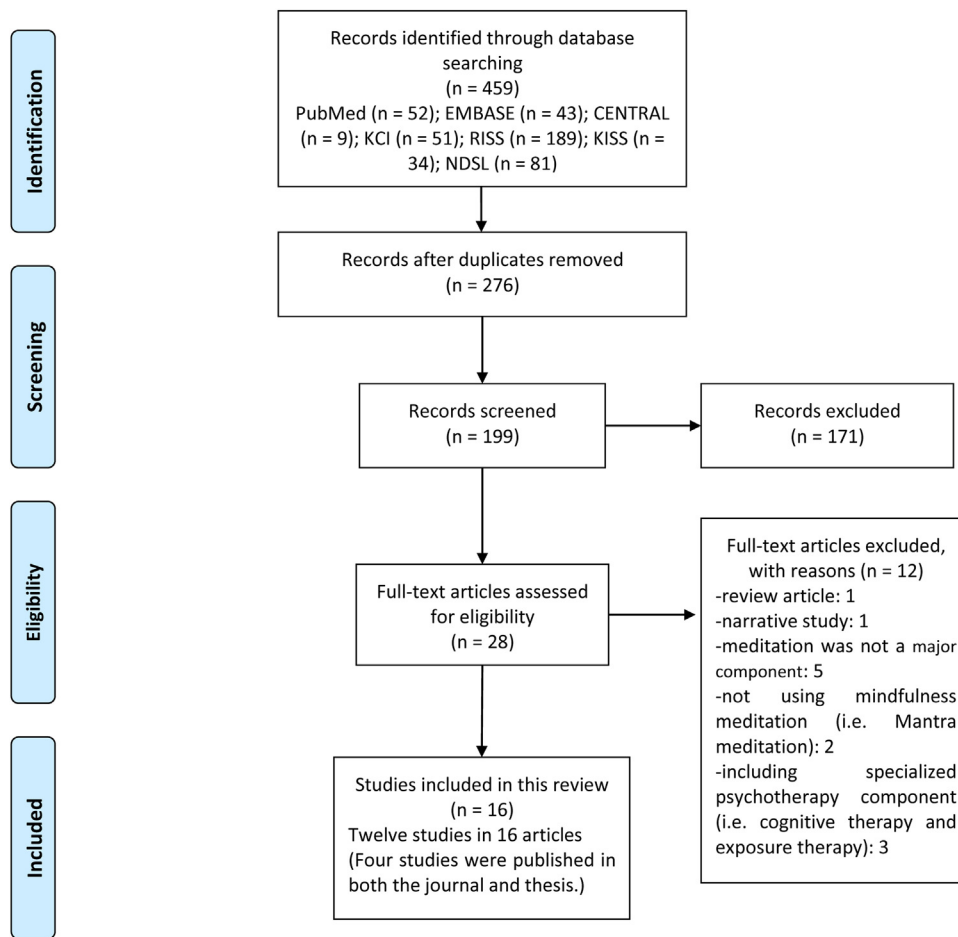* Studies that were published in both the dissertation and journal articles.

Fig. 1. PRISMA flow chart.
CENTRAL, Cochrane Central Register of Controlled Trials; KCI, Korea Citation Index; KISS, Koreanstudies Information Service System; NDSL, National Digital Science Library; RISS, Research Information Service System.

music meditation, which is a kind of passive meditation. Conversation meditation,[21,22] loving kindness meditation,[23–25,27,29,30] compassion meditation[28] and forgiving meditation[24,25,27,29] were used as meditation elements focusing on interpersonal, social, or spiritual relationships. The study by Kim,[28] which involved elderly women who had experienced the loss of their spouse, included compassion meditation as a component in all the sessions for a total of 16 sessions. Six studies were conducted over a duration of eight weeks or longer,[20,21,23–27,30,33] with a minimum of a week[18] and a maximum of sixteen weeks[26,28] in all studies. Except two studies, which involved walking meditation program for three times a week[31] or zen meditation for five consecutive days,[18] all the other studies were conducted once a week. The duration of each session was between 50 and 120 min (Table 1).

3.3. Effectiveness of the MM program for the Korean elderly

Previous studies (except for the study by Eum[24,27]) have indicated that the MM program increased the level of mindfulness of the participants.[19,20,29,32,33] Importantly, Jang[20] analyzed the impact of the MM program on participants with respect to various aspects of mindfulness; there was a significant impact of mindfulness on inattention and on the body. Park[29,32] also reported that the brief MBSR program significantly increased observing, noticing, and mind-body connection awareness. The elderly who participated in the MM program showed significant improvements in the life satisfaction scale,[19,24,27,29,32] and Eum[24,27] further

reported a significant improvement in the quality of life. Mixed results have been reported for stress, depression, and sleep quality. Three studies[19,24,27,29,32] reported a significant decrease in subjective stress in subjects, while one[23,30] reported no improvement. Considering stress biomarkers, one study[23,30] found no significant improvement in blood pressure and pulse, while the other study found significant benefits of MM program in rest heart rate and blood pressure.[18] Each study found a significant improvement in saliva cortisol level,[23,30] activity of autonomic nervous system as assessed by HRV,[31] and oversensitivity assessed by the Korean Elderly's Anxiety Scale.[29,32] Two studies[26,28] found improvements of EEG based indicators of stress including activity quotient and anti-stress quotient. There was a considerable improvement in depression in two studies,[19,29,32] but no significant change in another study.[25] The sleep scale indicated that there was a substantial improvement in sleep quality in one study,[25] but no significant improvement in insomnia in another study.[21,22] The outcomes were positive for cognitive aging, metabolic disorders, and chronic pain, which were the most common clinical conditions in the elderly. Kim[31] assessed the effect of the MM program on cognitive function and its related biomarkers in the elderly; the Korean version of Mini-Mental State Exam indicated considerable improvement in the cognitive function, and while the blood BDNF and DHEAs were significantly increased, the blood insulin and β-amyloid levels were significantly decreased. The study by Sim,[33] which targeted elderly women with chronic pain conditions indicated that the MM program significantly reduced pain

intensity as assessed by numerical rating scale and pain catastrophizing.

3.4. Considerations in the MM program design for the Korean elderly

Six studies[19–22,25,29,32,33] have described the factors, which are essential for the MM program targeted toward the elderly Korean people. Kim[19] has stated that any survey among elderly participants should be conducted with an assistant because of their illiteracy, while the study by Jang[20] has pointed out the participants' decreased vision. The participants' understanding of the questionnaire was slow, and the cognitive decline and distortion appeared to increase with age. While most Korean elderly participants had a great interest in physical health and actively sought external help, they were passive in mental health-related aspects. Jung[21,22] divided the elderly participants in the study into younger (65–74 years old) and middle-old (75–85 years old) groups to implement the program; the results suggested that conversation meditation and yoga meditation (active activity) are suitable for the younger group, while music meditation and breathing meditation (passive activity) are appropriate for the older group. To increase participation in the program, all participants were given a gift as an attendance award in the study conducted by Kim[25]. Considering that the elderly participants prefer to move their bodies, Park[29,32] placed hatha yoga first, but minimized the risk of falling, by avoiding potentially dangerous movement such as maintaining physical balance with one leg. Sim[33] has pointed out that most of the elderly participants in the facilities were women. Among the older men, program compliance was poor as they were working part-time jobs for a living.

4. Discussion

In both clinical settings and public health, the significance of MM has considerably increased.[1] However, the ways to implement MM as a disease prevention or treatment method is still a major challenge. The aim of this review was to collate clinical studies of MM program for the Korean elderly and summarize the considerations to design MM programs targeted toward the elderly in the future.

Except one study,[31] which had a walking meditation program, the other studies included MM programs that consisted of two or more meditation methods. Except one study,[18] which had a zen meditation program including sitting meditation and breathing meditation, all the MM programs included physical components such as walking meditation, physical meditation, or hatha yoga. More than half of these included interpersonal, social, or spiritual relationship-related components such as conversation meditation,[21,22] loving kindness meditation,[23–25,27,29,30] compassion meditation[28] and forgiving meditation.[24,25,27,29] The MM program was usually offered once a week over eight weeks. The duration of each session was usually between 60 and 90 min. Only half of the studies[19,23–25,27,29,31,32] described the practitioner's experience in implementing the MM program. A few participants had to drop out from some of the studies,[19,21,22,25,29,30,32,33] because of the following reasons: **(1) physical illness** ($n = 5$, in 4 studies[19,21–23,29,30,32]), which included difficulty in walking because of hurt legs and hospitalization; **(2) poor program compliance attributed to conflicting schedules** ($n > 7$ (Sim[33] did not report the exact number) in 3 studies[19,29,32,33]), which included the following: did not attend the entire course, did not participate in the program more than twice, received medical treatment at the same time, went on a visit to their son's/daughter's home, went to swim at the same time, had to care for grandchildren, had to attend another class, and went on travel with friends; **(3) withdrawal due to relocation** ($n = 2$, in one study[25]), which resulted in discharge from the senior welfare center; and (4) **a change of mind** ($n = 4$, in two studies[23,25,30]).

The MM program showed positive or mixed results depending on the outcomes. **(1) Mindfulness**: the MM program has been reported to improve the mindfulness levels,[19,20,29,32,33] particularly on inattention and on the body, and to improve the overall life satisfaction (especially the value of life) in the Korean elderly.[20,29,32] **(2) Stress, depression, and sleep quality**: mixed results have been reported for subjective stress, depression, and sleep quality. Regarding stress biomarkers, however, some outcomes including saliva cortisol level, HRV, and stress indicators of EEG showed a significant improvement.[23,26,28–32] One study found positive effect of MM program on oversensitivity of the Korean elderly.[29,32] **(3) Others**: All the studies reported that the MM program could potentially improve cognitive aging,[31] metabolic disorders,[31] and/or chronic pain.[33] Given the characteristics of the elderly, there is a high probability of having comorbidities such as chronic diseases; but, with the exception of Kim[28] and Sim,[33] no other study has mentioned any specific clinical issue in the inclusion criteria.

The authors of the included studies have presented some pertinent factors to design the MM program aimed at the Korean elderly. These could be classified into four categories: **(1) Physical limitations**: Because these subjects have reduced vision, cognitive decline, and frequent cognitive distortion, assessment through surveys can be difficult and an assistant is necessary. A small number of included studies assessed objective biomarkers including blood pressure, pulse, salivary cortisol, blood tests, HRV, and EEG; for future studies, these outcomes could be particularly effective in participants with significant physical limitations. In addition, taking into account the risk of falling in the elderly, it is recommended to minimize movements that can potentially increase the risk of falls, such as maintaining physical balance with one leg. **(2) Factors related to commitment**: Elderly subjects in Korea are interested and open-minded concerning their physical health, but may be passive and closed-minded regarding their mental health. Therefore, the appropriate composition of a MM program that mainly deals with physical health may be an important factor in increasing participation rate and retention rate. Additionally, offering a gift as an attendance award is a good way to increase their participation in the program. **(3) Classification of the elderly**: Age-oriented dispositions were also noted such that the younger-old (65–74 years old) could be effective in active forms of meditation such as conversation meditation, whereas the middle-old (75–85 years old) preferred passive forms of meditation such as music meditation. The arrangement of meditation components in consideration of these characteristics will help to increase the effectiveness of the program. Recently, attempts have been made to combine mindfulness and music, such as the mindfulness-based music therapy program.[34] In Korea, however, few studies have used music meditation in the elderly group.[35] In the future, MM programs for the elderly, especially for the middle-old or oldest-old, may be designed including music components. **(4) Gender bias**: Elderly men may have low participation in the MM program due to their employment in part-time jobs. Therefore, in the case of male participants, prior coordination of schedule may be an important factor; to increase their participation rate, the program could be scheduled once every one or two weeks. However, supplementary measures such as providing a booklet, homework, and multimedia files, which can increase participation appear to be necessary.

In terms of personalized care tailored to the participants' characteristics, the design of the MM program not only contributes to optimal clinical outcomes, but may also benefit a wide range of public health concerns.[1] The composition, preliminary effects, and design considerations of the MM program for the Korean elderly

found in this review may serve as a reference for practitioners and/or researchers who may plan for these MM programs in the future. However, the following limitations should be considered in the interpretation of this study: (1) None of the included studies had randomized controlled trials that could accurately determine the effectiveness of the program. Most of the studies were NRCTs, which means that selection bias may have affected the outcome and thus the effectiveness of the MM program is not guaranteed. (2) The tools and surveys used to evaluate outcomes in the included studies were seldom duplicated; this is important because heterogeneous tools were used to assess the effectiveness of the MM program in the Korean elderly. To accumulate evidence in the future, a consensus on the important outcomes and its assessment tools is necessary. (3) The practitioner's experience in implementing the MM program is likely to have a significant impact on its effectiveness as well as the participants' compliance. However, nearly half of the included studies did not mention the practitioner's experience. Although it is not necessary to design a fixed and homogeneous MM program in personalized care, the practitioner should be evaluated for their ability to run the program. Therefore, future studies should specify in detail the education, experience, and when possible, the relevant certifications of practitioners implementing the MM program. (4) Since our review focuses only on the MM program, several non-MM programs such as laughter therapy program conducted on the Korean elderly were excluded. However, non-MM programs may include suggestions that may be useful to plan intervention programs Notably, since only a few studies ($n = 12$) have been included in this review, the practitioner and/or researcher is expected to refer to studies on non-MM programs that will help plan MM programs for the Korean elderly. In this review, the authors have collated clinical studies of MM program for the Korean elderly and have summarized the considerations for designing future MM programs aimed toward the elderly. In general, the MM program was offered once a week over eight weeks. The duration of each session was usually between 60 and 90 min. The main reason for the participants' drop out was poor program compliance primarily attributed to conflicting schedules, physical illness, and a change of mind. The MM program showed either positive or mixed results depending on the outcomes, but it appeared to improve the mindfulness level of the participants. Several important considerations in designing the MM program for the Korean elderly were also discussed. The findings can be used as preliminary data by future practitioners and/or researchers to design MM programs focused on the elderly in Korea. It could also help policymakers integrate MM-based strategies into integrated care programs to promote mental health and well-being in the Korean elderly.

Acknowledgments

Author contributions

CYK: Conceptualization, Methodology, Investigation, Formal Analysis, Writing - Original Draft. SYC: Writing - Review & Editing, Supervision. JWK: Writing - Review & Editing, Supervision.

Conflict of interest

The authors declare no conflict of interest.

Funding

Ethical statement

This study did not involve any human or animal experiment.

Data availability

The data used to support the findings of this study are included within the article.

Supplementary material

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.imr.2020.100451.

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