Effects of Nature-Based Programs for Workers in Korea: A Systematic Review

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ABSTRACT

The aim of this study was to review previous literature to determine the effects of nature-based program for workers. This systematic review was conducted in accordance with National Evidence-based Healthcare Collaborating Agency's guidance for undertaking systematic reviews for intervention. Literature search was performed using National Assembly Digital Library, Korean Studies Information Service System, and Korea Education & Research Information Service for literature published until March 2019. The participants were full-time workers, and intervention of nature-based programs was conducted in the outdoor, indoor, and indirect nature contact exposures, with comparators in the control group who did not receive the treatment. The results showed that the programs were effective in physical, psychological, and social health. The methodological quality of randomized controlled trials (RCT) was assessed using the Cochrane Risk of Bias (RoB) tool, while non-randomized controlled trials (N-RCT) were assessed using the Cochrane Risk of bias assessment tool for non-randomized studies (RoBANS). A total of 16 studies were selected for assessment: two RCTs, 10 N-RCTs, and four one-group pretest-posttest designs. Most interventions were provided at the workplace and in the community. There were many kinds of nature-based interventions, and forest therapy and horticultural therapy programs were most common. Various interventions for workers effectively improved job stress, depression, serum cortisol and stress-response. However, the included studies lacked methodological rigor. Future research is needed to evaluate the long-term effectiveness of nature-based programs for workers using rigorous research designs.

Keywords: burnout, forest therapy, horticultural activities, job stress, officer

Introduction

According to the World Health Organization (WHO), burnout syndrome is not a medical condition but is regarded as 'factors influencing health status' and is recently prevalent in the lives of workers worldwide. Moreover, Korea Association of Health Promotion mentioned 'burnout syndrome', 'overadaptation syndrome', 'super worker syndrome' and 'chronic fatigue syndrome' as four syndromes related to workers, suggesting the need for particular care. This aroused people's attention to stress at work, which had been taken lightly. Since workers in Korea spend most

of their day at work, they tend to build up stress when the rapidly changing environment is beyond their capabilities or they cannot handle it properly, which directly affects life and health (E.J. Lee, 2019). Accordingly, there is more emphasis on the importance of socially managing job stress, such as the increasing demand for counseling service at work so that workers can reduce stress and increase job satisfaction (Au, 2017).

Previous studies on programs to relieve job stress include the dance movement therapy program by J.H. Lee (2005), music therapy program by S.K. Lee (2005), worker stress management program by Choi (2015), and mandala-applied

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group art therapy program by Jeong (2017). In particular, studies on intervention of nature-based programs to relieve physical and psychological stress of workers are actively conducted in Korea (Jung et al., 2014; Kim, 2014; Shin et al., 2003; Song, 2017). Nature-based programs use natural resources to bring positive effects to human body and mind. To clarify the category of the nature-based program used as the intervention in this study, we considered the scope of the intervention program based on the Assessment of Natural Elements by Mausner (1996), taking into account the compatibility and suitability with the meaning of nature used in the modern society, among previous studies on the category of natural environments. Mausner (1996) included items such as ‘forest’, ‘mountain’, ‘garden’, ‘lake’, ‘tree’, ‘flower’, ‘water’, and ‘animal’ in the category of natural elements, and divided them into subcategories such as ‘Totally natural environments’, ‘Civilized natural environments’, ‘Semi-natural environments’, and ‘Quasi-natural environments’ to define the boundaries of natural environment.

Korea has the fourth-highest ratio of forests to the national territory among the OECD countries after Finland (73.1%), Japan (68.5%), and Sweden (68.4%), and these thick, green forests take up approximately 63% of the entire territory (Park, 2019). Accordingly, Korea Forest Service provides customized forest welfare service for each life cycle using nature to improve quality of life for the nation, and is also planning and implementing various programs for workers. Firefighting officers that received welfare service through nature-based programs showed increase in vitality and decrease in depressive state and posttraumatic stress (PCL-5), and workers engaging in emotional labor showed increase in stress resistance and decrease in stress index and fatigue (Korea Forest Welfare Institute, 2019). Activities in nature and natural elements may have positive effects on not only working life but also attitude at work (Brown et al., 2014). Moreover, after a year of follow-up study on workers, it was found that physical activities in the natural environment during leisure may contribute greatly to the well-being of workers (Korpela et al., 2017).

Many studies are already being conducted overseas on systematically reviewing literature on nature-based program interventions such as ‘forest therapy’, ‘horticultural therapy’, and ‘wilderness therapy’ to come up with ther-

apeutic effects (Bettmann et al., 2016; Hansen et al., 2017; Oh et al., 2017). systematic reviews are also published more actively in Korea as well on nature-based intervention programs (Jung, 2019; Lee et al., 2016; Song and Bang, 2017). Systematic review is a literature review to determine the research areas to improve or the latest research trends by summarizing available research findings and providing comprehensive grounds for the effects of relevant research (Kim et al., 2011).

However, despite the increase in systematic reviews that use nature-based programs as interventions, there has been no systematic review on the effects of the nature-based programs for workers. Clear and comprehensive understanding about the effects of nature-based programs for workers is very important in planning and improving programs for workers in the modern society in which various health problems are prevalent due to job stress.

Therefore, this study was attempted to examine experimental studies in Korea on how the intervention of nature-based programs actually affected the health of workers, and systematically review the key findings. Based on the results, we intend to provide the basis and data to come up with nature-based programs for workers in light of the circumstances in Korea.

Research Methods

Literature search

We searched academic journals and theses published in Korea from the initial release provided by the search engines to March 2019, using three online databases such as National Assembly Library (NAL), Koreanstudies Information Service System (KISS), and Research Information Sharing Service (RISS) by Korea Education & Research Information Service. Search words (keywords) were ‘forest therapy’, ‘woods’, ‘forest’, ‘flower’, ‘animal’, ‘horticultural therapy’, ‘park’, ‘natural environment’, ‘walk’, ‘urban forest’, ‘garden’, ‘nature’, ‘plant’, ‘walking’, ‘leisure’, ‘recreation’, ‘program’, ‘intervention’, ‘workers’, ‘personnel’, ‘labor’, ‘company staff’, ‘employee’, ‘burnout’, ‘stress’, ‘well-being’, ‘job’, and ‘health’. We searched more efficiently by checking

synonyms and alternative words and using the Boolean operators (and, or, not, etc.).

Selection criteria

Inclusion criteria

We selected the inclusion criteria of literature according to PICO. PICO is developed in the planning stage of the research process of systematic review, and is comprised of population (participant/patient), intervention, comparison (control/comparator), and outcome (Kim et al., 2011). We reviewed literature selecting healthy full-time workers without a specific disease (P), literature using only nature-based programs as an intervention tool (I), literature with a comparison group of workers who maintained daily life without participating in nature-based programs (C), and literature verifying the multilayered effects of nature-based programs (O). As the study design methods, we selected all experimental studies determining the effectiveness of nature-based programs as an intervention, including non-randomized controlled trials, randomized controlled trials, and quasi-experimental studies.

Exclusion criteria

For the exclusion criteria, we excluded literature in which the participants are not workers, or are workers with diseases (P), literature in which the intervention tool is not a nature-based program or also used other intervention programs (I), literature that is not a pretest-posttest experimental study on intervention (C), and literature that did not prove the effect of intervention or have insufficient outcomes (O). For quantitative integration of data, we also excluded case studies, qualitative research, literature reviews, and meta-analysis as well as literature with no full text available.

Data extraction

This study aligned literature searched on the databases in Korea and removed duplicates using the MS office Excel 2002 program by Microsoft Corporation (Redmond, US). In the primary exclusion, we reviewed the literature by titles and abstracts. Then, in the secondary exclusion, we

reviewed full-text articles to select and exclude literature based on PICO. Two researchers independently selected the literature for analysis. When there were disagreements in the selection process or during the full-text review, the researchers sufficiently discussed the matter and gathered their views in deciding on the final articles. To extract the core contents of the ultimately selected articles without omission, the characteristics of variables were systematically summarized using the coding chart developed according to the guidance for undertaking systematic reviews by National Evidence-based Healthcare Collaborating Agency (NECA) by Kim et al. (2011). The coding chart is comprised of author, year of publication, research design, research participants, intervention method, measurement tools, and intervention outcomes.

Quality assessment tool

Quality assessment is the process of assessing the validity of literature and guarantee the minimum qualitative level by estimating errors due to elements causing underestimation or overestimation of intervention effect (Kim et al., 2011). For quality assessment, this study used the RevMan 5.3 (review manager) program provided by Cochrane Community (London, UK) for free to help conduct systematic review and write articles on meta-analysis. This program takes the form of a checklist and is easy to use with specific guidelines on whether to rate each item as 'high', 'low' or 'unclear' in terms of risk of bias. Quality of literature can be assessed as follows: 'high risk' when one or more main items have high risk of bias, 'unclear risk' when one or more main items have unclear risk of bias, and 'low risk' when one or more main items have low risk of bias. Quality of randomized controlled trials was assessed in seven subitems according to the Cochrane risk of bias criteria, such as random sequence generation, allocation concealment, blinding of participant/personnel, blinding of outcome assessor, incomplete outcome data, selective reporting, and other potential sources of bias. Quality of non-randomized studies including one-group pretest-posttest designs and non-randomized controlled trials was assessed in six items according to the Cochrane risk of bias assessment tool for non-randomized studies, such as selection

of participants, confounding variables, measurement of (intervention) exposure or outcome, blinding of outcome assessment, incomplete outcome data, and selective reporting. Finally, we summarized and interpreted the results of the risk of bias in each article included in this study and created charts of the results.

Results and Discussion

Study identification and selection

By using the Korean online databases NAL, RISS, and KISS, 6827 articles were searched initially. As a result of excluding 1965 duplicate articles and reviewing the rest with focus on titles and abstracts, there were 4831 articles completely unrelated to the topic of this study, which were all excluded as well. We reviewed full texts of the 31 primarily selected articles based on the selection criteria we

have established, and ultimately selected 16 articles excluding six articles including other participants, three articles without clear outcomes, three articles with no full text available, and three articles that are not experimental studies such as reviews (Fig. 1).

Study characteristics

Research status

There were total 16 articles included in this systematic review from the initial release provided by the search engines to March 2019. The articles were published between 2001 and 2019, and 15 out of 16 were published in the last 10 years. By category, two articles (12.5%) were randomized controlled trials and 14 (87.5%) were non-randomized trials. Out of 14 non-randomized studies, four articles (25.0%) were one-group pretest-posttest designs and 10 (62.5%) were non-randomized controlled trials. By publication type, 12 (75%) were master's and doctoral dis-

Fig. 1. Flowchart of the study selection process. NAL = National Assembly Library; KISS = Koreanstudies Information Service System; RISS = Research Information Sharing Service.

sertations and four of them (25%) were scientific journal articles. Out of 12 dissertations, six (50%) were master's and six (50%) were doctoral dissertations (Table 1).

Characteristics of participants

The number of participants ranged greatly from 14 to 224, and most of the studies (seven articles, 47%) had 21-50 participants. By occupation, there were 300 educational workers (28.3%), 287 mental health counselors (27.0%), 138 social welfare facility workers (13.0%), 118 medical workers (11.1%), 100 general office workers (9.4%), 60 telemarketers (5.7%), 30 technical workers (2.8%), 15 police officers (1.4%), and 13 financial workers (1.3%).

Intervention of nature-based programs and dependent variables

There were many names of nature-based intervention programs for workers, such as 'interpersonal caring horticultural activities program', 'forest therapy program', 'acceptance commitment therapy based horticultural therapy program', horticultural therapy, horticultural activity, 'urban forest walking program', 'healing forest walk', etc. Reclassified with focus on the details of each program, there were seven articles (43.7%) on 'forest therapy programs' including meditation, trail hiking and breathing, and seven articles (43.7%) on 'horticultural therapy programs' including flower arrangement, making potpourri and hydroponics,

followed by two articles (12.6%) on 'walking programs'.

The places where interventions were provided were mostly community infrastructures (six articles, 37.5%; national natural recreation forests, national centers for forest therapy, etc.) and education centers in workplaces (four articles, 25%). The period of intervention was divided into the multi-day type and the session type. For the multi-day type, there were three articles (18.7%) on 1 night and 2 days and two articles (12.6%) on 2 nights and 3 days, while for the session type, there were four articles (25.0%) each for 1-5 weeks and 6-10 weeks and three articles (18.7%) for 11-20 weeks. The weekly number of interventions for the session type was mostly one time, with the length per session ranging from 20 to 90 minutes, most of which were 60 minutes long.

The purpose of program intervention was either one or two and more of physical health improvement, psychological/emotional health improvement, and social health improvement. Studies on social health improvement such as interpersonal caring were covered in all 16 articles. 10 articles (62.5%) were for psychological/emotional health improvement and three articles (18.7%) were for physical health improvement. We analyzed the measurement tools for dependent variables to analyze the effects of intervention by domain. There were 25 tools (41.0%) measuring the social domain such as job stress, followed by 18 tools (29.5%) measuring the psychological/emotional domain, 13 tools (12.3%) measuring the physiological domain, and five

Table 1. Key features of previous studies used in this study

Variables	Category	Frequency (%)
Publication year	2001-2011	1 (6.3)
	2011-2019	15 (93.7)
Study design	Randomized controlled trial design	2 (12.5)
	Non-randomized controlled trial design	10 (62.5)
	One-group pretest-posttest design	4 (25.0)
Classification of articles	Master's and doctoral dissertations	12 (75.0)
	Scientific journal articles	4 (25.0)
Sample size	≤20	1 (6.3)
	21-50	7 (43.7)
	51-100	6 (37.5)
	>100	2 (12.5)

Note. N=16.

Table 2. Intervention and dependent variables of nature-based programs in previous studies

Variables	Category	Frequency (%)	
Intervention category	Forest therapy programs	7 (43.7)	
	Horticultural therapy programs	7 (43.7)	
	Walking programs	2 (12.6)	
Intervention setting	Workplace	4 (25.0)	
	University	3 (18.7)	
	Community	6 (37.5)	
	Hospital	2 (12.5)	
	School	1 (6.3)	
Experimental period	Multi-day program	1 night 2 days	3 (18.7)
		2 nights 3 days	2 (12.6)
	Session therapy	1-5 weeks	4 (25.0)
		6-10 weeks	4 (25.0)
		11-20 weeks	3 (18.7)
Purpose of intervention program outcomes	Physical health improvement	3 (18.7)	
	Psychological health improvement	10 (62.5)	
	Social health improvement	16 (100)	
Dependent variables measurement	Cognitive	5 (8.2)	
	Physical	13 (21.3)	
	Emotional	18 (29.5)	
	Social	25 (41.0)	

Note. N=16.

tools (8.2%) measuring the cognitive domain (Table 2).

Characteristics of nature-based programs for workers

There were diverse nature-based programs for workers in the final 16 articles in terms of content. Table 3 shows the participants, period and place of intervention, group size, intervention method, content, measurement tool, and major outcome variables. Interventions were either directly provided by the researchers or carried out by horticultural therapists, forest therapists or qualified experts. By content, seven articles used forest therapy programs as interventions and compared the effects, four of which were non-randomized controlled trials and three were one-group pretest-posttest designs. The forest therapy programs were comprised of meditation, yoga, trail hiking, forest walking, and hydrotherapy. There were total seven articles that used horticultural therapy programs as interventions and compared the effects. One of them was a randomized controlled trial

and six were non-randomized controlled trials. The horticultural therapy programs were comprised mostly of making things with plants, such as making flower baskets, making potpourri boxes, and making terrariums and topiaries. Finally, two articles used walking programs as interventions and compared the effects, one of which was a randomized controlled trial and the other was one-group pretest-posttest design.

Effects of nature-based programs according to the intervention purpose

This study classified the intervention effects of nature-based programs for workers into social, physical and psychological/emotional effects with reference to the classification criteria of horticultural therapy effects by Korean Horticultural Therapy and Well-being Association (<http://www.khta.or.kr>). Moreover, we marked the variables showing significant effects as (+) and the ones showing insignificant effects as (-) in Table 3 to present the effects of outcome variables.

Table 3. Summary of previous studies about nature-based programs for workers

Firs tauthors (Year)	Study design	Study participants (n)		Intervention(s)	Duration of intervention	Control	Measurements		Outcomes (statistical significance)
		Experimental group	Control group				Setting	Name of intervention (detailed contents)	
Park (2016)	Non-randomized controlled trial design	Office workers (n=55)		Interpersonal caring horticultural activities program (Planting foliage plant, flower and herb plant, Making a flower basket, small garden, healing party)	Twice a week (for 80 min) for 5 weeks	Normal daily routines	Self-esteem scale Korea Occupational Stress Scale	Cortisol IgA	Self-esteem (-) Job-stress (-) Emotional intelligence (-) Stress coping (+) Happiness (+) Interpersonal caring behavior (+) Cortisol (+) IgA (-)
		n= 27	n=28				At workplace		Wong's Emotional Intelligence Scale Coping Response Inventory Happy-Life scale Interpersonal caring behavior scale
Lee (2015)	One-group pretest-posttest- only design	Public servants (n=62)		Forest therapy program (Green shower, Therapeutic walk, Meditation, Forest healing games)	One night two days Exp. 1: Jun, 17-18, 2014 / Jun. 19-20, 2014 Exp. 2: August 25-26, 2014	-	Self-esteem scale Korea Occupational Stress Scale	Heart rate Variability	Self-esteem (+) Job-stress (+) Depression (+) Total mood disturbance (+) Mean HR (+) / TP (+) Mean HF (-) / SDNN (-)
		Exp. 1 social welfare consultant	Community (National Recreation Forest / Academic forest)				Self-rating depression scale Profile of mood states		
Park et al. (2018)	Non-randomized controlled trial design	University employees (n=14)		Forest therapy program (Walking/Yoga/Breathing/Me ditation in the forest, Tree climbing)	Once a week (for 60 min) for 4 weeks	Normal daily routines	Resilience scale Concise measure of subjective well-being	-	Resilience (+) Satisfaction of life (+) Positive feelings (+) Negative feelings (+) Happiness (+)
Lee et al. (2018)	One-group pretest-posttest- only design	Emotional labor workers (n=224)		Forest therapy program (Walking in the forest path, Try a hammock, Hydro-therapy, Health healing equipment experience, Tea and Meditation, Balance therapy)	Two night three days April-May, 2018	-	Woker's Stress Response Inventory Positive and Negative Affect Schedule	-	Woker's stress (+) Positive feelings (+) Negative feelings (+)
		n= 224	-				Community (National Center for Forest Therapy)		
No (2018)	Non-randomized controlled trial design	Welfare facility workers (n=68)		Forest therapy program (First session: Forest commentary, Meditation, disability experience Second session: Tea and Meditation Third session: Feeling catharsis, Knowing SWOT, etc.)	Six weeks (3 times) First session: Jun, 18-30, 2018 Second session: July, 2-14, 2018 Third session: July, 16-28, 2018	Normal daily routines	Emotional labor scale Maslach Burnout Inventory	-	Emotional labor (+) Burn-out (+)
		n= 34	n= 34				Community (National Recreation Forest)		
Kim (2018)	Non-randomized controlled trial design	Social welfare workers (n=32)		Forest therapy program (Trekking, Meditation, Walking in the forest, Forest concert)	One night two days Jun, 23-24, 2016	Indoor educationl; forest therapy program development	Korea Occupational Stress Scale (KOSSR-26) Psychosocial Well-being Index State-Trait Anxiety Inventory	Pulse Blood pressure	Job-stress; Women(+) Psychosocial well-being(+) Anxiety(+) Physical stress;Men(+) Stress resistance; HR(+)/ TP(+) HF(-)/ SDNN(-)
		n= 16	n= 16				Community (National Recreation Forest)		
Park (2016)	Randomized control trial design	ICT research workers (n=30)		Acceptance commitment therapy based horticultural therapy program (Making flower box, poppy box, Bouquet of flowers and grass doll, Flower arrangement)	Twice a week (for 90 min) for 6 weeks	Normal daily routines	Acceptance and Action Questionnaire Psychological wee-being scale Korea Occupational Stress Scale	-	Acceptance commitment(+) Psychological well-being(+) Job stress(+); 'job demand' 'insufficient job control' 'interpersonal conflict' 'job insecurity' 'organizational system'
		n= 15	n= 15	At workplace					

Table 3. (continued)

Firs tauthors (Year)	Study design	Study participants (n)		Intervention(s)	Control	Measurements		Outcomes (statistical significance)	
		Experimental group	Control group			Setting	Name of intervention (detailed contents)		Duration of intervention
Choi (2011)	Non-randomized controlled trial design	Hospital staff	(n=22)	Horticulture therapy program (Flower arrangement, Christmas wreath&herb cuttage, Pressed flower frame, Flower basket, topiary, Corsage&bouquet, etc.)	Normal daily routines	Once every other week for 20 weeks	Stress response inventory	Blood pressure Salivary cortisol	Stress response (-) Depression (-) Serum cortisol (+) Blood pressure (+)
		n= 11	n= 11				At the hospital		
Ha (2012)	Non-randomized controlled trial design	Women teacher in middle school	(n=33)	Horticultural activities (Terrarium, Plate garden, Corsage, Water culture, Topiary, etc.)	Normal daily routines	Once or Twice a week (for 60 min) for 9weeks (12 times)	Psychological Well Being Scale Job-stress scale (Gang, 2008) Maslach Burnout Inventory Teacher efficacy scale (Lee, 1998)	-	Psychological well-being (+) Job-stress (+) Burnout (-) Teacher efficacy (+)
		n=19	n=14				At school		
Choi (2014)	Non-randomized controlled trial design	Women wokers	(n=87)	Horticultural activity program (Dish garden, Terrarium, Hanging plant, Art flower frame, Planting cactus, Seed collage)	Normal daily routines	Once a week (for 60 min) for 8weeks (8 times)	Stress diagnostic survey The ways of coping checklist Job satisfaction scale Horticultural preference	-	Exp.1 Job stress(+)/ Ability to react(-) Job satisfaction(+) Horticultural preference(-); Planting cactus Exp.2 Job stress(-)/ Ability to react(-) Job satisfaction(-)/ Horticultural preference(-); Napkins craft planting Exp.3 Job stress(-)/ Ability to react(-) Job satisfaction(+)/ Dish garden Exp.4 Job stress(-)/ Ability to react(-) Job satisfaction(-)/ Cut flower topiary Exp.5 Job stress(-)/ Ability to react(-) Job satisfaction(-)/ Art flower frame Exp.6 Job stress(-)/ Ability to react(-) Job satisfaction(-)/ Dish garden
		Exp. 1(n=8) Exp. 2(n=6) Exp. 3(n=8) Exp. 4(n=7) Exp. 5(n=7) Exp. 6(n=7)	Con. 1 (n=8) Con. 2(n=7) Con. 3(n=8) Con. 4(n=7) Con. 5(n=8) Con. 6(n=6)				At workplace		
Bang et al. (2016)	Randomized control trial design	Office workers	(n=45)	Urban forest walking program (Based on information-motivation- Behavioral-Skills Model)	Normal daily routines	Twice a week (for 40 min) for 5weeks	Health Promoting Lifestyle Profile Beck Depression Inventory General Health Questionnaire	Total body activity (Metabolic Equivalent Minutes) Body Mass Index Blood pressure Calcaneus bone	Depression(-) Quality of life (+) Body composition analysis (+) Bone density (-) blood pressure (-) BMI (-)
Jung (2012)	Non-randomized controlled trial design	Hospital woman staff	(n=27)	Horticulture activity program (Rapport formation ;lawn doll, Pressed flower frame/ Relaxion of negative sentiment ; centerpiece, Making a terrarium, Water culture/ stress decrease ; Topiary, Christmas wreath)	Normal daily routines	Once a week (for 90 min) for 12weeks	Stress response inventory The way of coping checklist	ACTH (EDTA-bottle) Cortisol	Stress response (+) Stress coping (+) ACTH (-) cortisol (-)

Table 3. (continued)

First authors (Year)	Study design	Study participants (n)		Intervention(s)		Control	Measurements		Outcomes (statistical significance)
		Experimental group	Control group	Setting	Name of intervention (detailed contents)		Self-Report Measures	Physiological Measures	
Kim (2012)	Non-randomized controlled trial design	Tele-marker (n=60)	n=20	At workplace	Exp.1 : Horticultural therapy program (Planting plants, Hydroponic culture, Making bird cage frame potpourri, Planting orchids, Making flower box, Making Bouquet, etc.)	Normal daily routines	Korean Occupational Stress Scale	Saliva cortisol	Exp.1 Job-stress(+) / Serum cortisol(+)/Emotional labor(+)/ Depression(+)/Anxiety(+)/Self-esteem(+)*
					Exp.2 : Observed completed work made by experimental group1.		Depression scale	Emotional labor scale	Exp.2 Job-stress(+) / Serum cortisol(-)/Emotional labor(-)/ Depression(+)/Anxiety(+)/Self-esteem(+)*
Han (2019)	One-group pretest-posttest-only design	Hospital workers (n=56)	n=56	At the hospital	Healing forest walks (Connected to the hospital using a short break)	Three times a week (for 20 min) for three weeks	Korean Version of Profile of Mood States Korean Occupational Stress Scale	-	Mood States(+); except depression Quality of life (+) Job-stress(+)
					Forest therapy program (Walking in forest, Observing the forest, Exercise & Meditation in forest, Music therapy)		Maslach Burnout Inventory general survey Worker's Stress Response Inventory Recovery Experience Questionnaire	HRV; SDNN, RMSSD, LF, HF Cortisol NK cell activity	MBI-GS (+) WSRU(+) except depression REQ (+) HRV (-); SDNN, RMSSD, LF, HF, MHR (+) Cortisol (+) NK cell activity(-)
Jung et al. (2015)	Non-randomized controlled trial design	Healthcare and counseling service industries female workers (n=39)	n=19	University (Academic forest)	Forest therapy program (Feeling in the Forest, Hydro-therapy, Walking in the forest, Tea and Meditation)	3 days and 2 nights (25-27, Oct)	Normal daily routines	Woker's Stress Response Inventory Positive and Negative Affect Schedule	Stress response (+) Somatization (+) Depression (+) Anger (+) Work (-) Stress response by duty responsibility (+) Positive feelings (+) Negative feelings (+)
Park et al. (2017)	One-group pretest-posttest-only design	Teachers (n=221)	n= 221	Community (National Center for Forest Therapy)	Forest therapy program (Feeling in the Forest, Hydro-therapy, Walking in the forest, Tea and Meditation)	One night two days May-October, 2017	Woker's Stress Response Inventory Positive and Negative Affect Schedule	Stress response (+) Somatization (+) Depression (+) Anger (+) Work (-) Stress response by duty responsibility (+) Positive feelings (+) Negative feelings (+)	Stress response (+) Somatization (+) Depression (+) Anger (+) Work (-) Stress response by duty responsibility (+) Positive feelings (+) Negative feelings (+)

Social effects

Social effects are anticipated to promote receptive capacity and understanding about the environment that involves many people such as social activities and group work and improve self-reliance and interpersonal skills, thereby enabling people to adapt well to daily life. In all 16 final articles selected, social health indicators such as quality of life and job stress were used to compare the effects. Studies reporting that the intervention of nature-based programs increased the scores of the experimental group in the pretest-posttest of quality of life were by Bang et al. (2016) and Han (2019), and the intervention programs were both forest walking. Level of job stress, which is the most commonly used indicator to come up with social effects, decreased significantly in studies by Choi (2014), Ha (2012), Han (2019), Kim (2012), Kim (2018), Lee (2015), Lee et al. (2018) and Park (2016). Job stress was classified into seven sub-factors such as job demand, insufficient job control, job insecurity, interpersonal conflict, organizational system, lack of reward, and occupational climate, and the interventions used were forest therapy and horticultural therapy programs. The results show that nature-based programs for workers have a positive impact on social effects.

Physical effects

Physical effects are anticipated to promote cardiopulmonary function, muscular strength and immunity through physical activities, thereby securing physiological stability of the human body. Physical health indicators such as blood pressure and body composition were used in studies by Bang et al. (2016), Choi (2011) and Jung et al. (2015) to compare the effects. Choi (2011) reported that carrying out 10 sessions of the horticultural therapy program led to a decrease in blood pressure of the experimental group. Bang et al. (2016) came up with statistically significant results that the experimental group, which participated in the urban forest walking program, showed more favorable health promotion activities than the comparison group. These results prove that nature-based programs have a positive impact on physiological stability of the human body as well as physical effects.

Psychological/emotional effects

Psychological/emotional effects are anticipated to bring the experience of emotional purification by alleviating negative emotions and inducing psychological stability and positive change. Studies that showed the effects in the psychological/emotional aspects were by Bang et al. (2016), Choi (2011), Ha (2012), Han (2019), Jung et al. (2015), Lee (2015), Lee et al. (2018), Park (2017), Park et al. (2017), and Park et al. (2018). Mood state (Han, 2019; Lee, 2015; Lee et al., 2018; Park et al., 2018), psychological well-being (Ha, 2012; Park, 2017), and depression (Bang et al., 2016; Choi, 2011; Lee, 2015) were used as psychological/emotional health indicators. Other psychological/emotional health indicators except depression in Choi (2011) and positive emotions in Park et al. (2017) showed statistical significance.

Quality assessment

This study assessed the quality of selected literature using ‘risk of bias’ for two randomized controlled trials and ‘risk of bias assessment tool for non-randomized studies’ for 14 non-randomized controlled trials. As a result, we found that there was no clear description about confounding variables and blinding of outcome assessment in 14 non-randomized controlled trials, and it was difficult to confirm whether suitable allocation concealment and blinding were used in two randomized controlled trials.

For random sequence of two randomized controlled trials, risk of bias was assessed as ‘low’ using a suitable random allocation method such as a computer program (Random allocation software 2.0). In both articles, risk of bias was ‘high’ for blinding of participant/personnel, whereas blinding of outcome assessment was not covered in the articles, and thus risk of bias was ‘unclear’. Both articles had low risk of bias in incomplete outcome data, selective reporting, and other potential sources of bias.

As for non-randomized controlled trials, all 14 articles did not mention confounding variables and blinding of outcome assessment, and thus risk of bias was assessed as ‘unclear’. four one-group pretest-posttest designs did not have a comparison group and thus had ‘high’ risk of bias in selection of participants. For measurement of intervention,

Table 4. Quality assessment of non-randomized controlled trials

First author (year)	Risk of bias assessment tool for non-randomized study					
	Selection of participants	Confounding variables	Measurement of intervention	Blinding of outcome assessment	Incomplete outcome data addressed	Selective reporting
Lee (2015)	H	U	L	U	L	L
Park et al. (2018)	L	U	L	U	L	L
Lee et al. (2018)	H	U	L	U	L	L
No (2018)	L	U	L	U	U	L
Kim (2018)	L	U	L	U	U	L
Park (2017)	L	U	L	U	L	L
Choi (2011)	L	U	L	U	L	L
Ha (2012)	L	U	L	U	L	L
Choi (2014)	L	U	L	U	L	L
Jung (2012)	L	U	L	U	L	L
Kim (2012)	L	U	L	U	L	L
Han (2019)	H	U	L	U	L	L
Jung et al. (2015)	L	U	L	U	L	L
Park et al. (2017)	H	U	L	U	L	L

Note. H = high; L = low; U = unclear.

all articles included had ‘low’ risk of bias due to the nature of experimental research mostly with intervention. For incomplete outcome data, two articles did not report clear figures on individual outcome data of participants and thus had ‘unclear’ risk of bias. For selective reporting, all 14 articles described the intervention results defined in advance, thereby ‘low’ in risk of bias (Table 4).

Discussion

This study was conducted to comprehensively review the research and intervention methods as well as outcomes in previous experimental studies that verified the effects of nature-based programs on workers through online Korean database search, and establish basic data required for related experimental studies in the future. Currently, intervention studies on nature-based programs for workers are gradually increasing, and most intervention programs are on forest therapy, horticultural therapy and walking. These nature-based programs proved to have significant effects on the social, physical and psychological/emotional aspects of workers. The results can be discussed as follows.

First, as a result of summarizing the characteristics of

literature analyzed in this study, we found that articles on nature-based programs for workers are recently increasing, and most of them are graduate dissertations. Furthermore, the occupations of participants were diverse such as teachers, medical workers, police officers, financial workers, social workers, and mental health counselors, and most workers were involved in emotional labor. In most articles, the purpose of intervention was to improve social health, and they mainly used forest therapy, horticultural therapy, and walking as intervention methods. Most articles had the intervention period of 10 sessions, 60 minutes per session, and used measurement tools such as the scale for stress coping skills in the cognitive domain, blood pressure in the physical domain, psychological well-being scale in the psychological/emotional domain, and job stress scale in the social domain. The fact that studies on nature-based programs for workers have constantly increased in the last 10 years indicates that the society is now showing more interest in health of workers. In particular, the fact that many studies are conducted on workers involved in emotional labor that are directed to stage emotions or feelings toward customers as demanded by the organization implies the high turnover rates of relevant occupations due to ex-

cessive job stress as well as severe level of depression (Cheong et al., 2008). However, most studies on intervention of nature-based programs for workers involved in emotional labor are non-randomized controlled trial designs. Thus, to come up with evidence-level research that can be acknowledged by the academia, it is necessary to select a systematic research method following RTC research by preferentially considering a single-blind randomized controlled trial design.

Second, most studies on intervention of nature-based programs for workers had the purpose of social health improvement, followed by psychological/emotional health improvement and physical health improvement. Sub-factors of social health were job stress, quality of life, teacher efficacy, self-esteem, interpersonal caring, and job burnout. Sub-factors of psychological/emotional health were psychological well-being, depression, positive emotion, negative emotion, happiness, and anxiety. Many articles intended for social health improvement showed a significant improvement in level of job stress, while articles intended for psychological/emotional health improvement showed effects in depression, happiness, psychological well-being, positive and negative emotion. This is in line with the attention restoration theory by Kaplan and Kaplan (1989), who determined that a restorative environment recovers fatigue, and a typical restorative environment for people today exhausted by urban life is the forest (Herzog et al., 1997). Moreover, Ulrich (1993) stated that the natural environment reduces stress. As such, this study discovered that intervention of nature-based programs are effective in improving social health and psychological/emotional health of workers based on the theories in previous literature.

Third, it is necessary to analyze and clearly understand the mediator variables affecting job stress, along with the effect of nature-based programs on workers. This study proved that nature-based programs had positive effects on physical, mental and social health of workers. In particular, job stress was the most commonly measured variable, but all articles lacked explanation about which variable had the most effect in the path through which job stress decreased. M.K. Lee (2019) discovered that ‘active stress coping method’ such as coping with stress with the help of one’s boss at work or acquaintances is a mediator varia-

ble in the path through which job stress affects job satisfaction. Analyzing variables related to job stress along with nature-based intervention will help develop highly effective programs.

Conclusion

This study was attempted to comprehensively examine previous literature verifying the intervention effects of nature-based programs for workers, as well as the characteristics and effects of intervention. We selected literature based on the inclusion/exclusion criteria among those on nature-based programs for workers from the initial release provided by the search engines to March 2019, and systematically reviewed them through the process of quality assessment. Accordingly, we found out that nature-based programs had significant effects on social, psychological/emotional and physical aspects of workers, and could comprehensively examine the overall aspects of workers as well as various intervention methods. Even though this study has limitations in that it searched literature on three databases only, we could conclude that nature-based programs have positive effects on workers since we analyzed the articles in compliance with the methodological process according to NECA's guidance for undertaking systematic reviews. Based on the results above, it is necessary to conduct many randomized controlled trials to more clearly prove the effects of nature-based programs on workers, as well as to additionally conduct systematic methodological research and development and experimental studies. Furthermore, policy and institutional efforts must be made to promote workers’ participation in nature-based programs.

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