

Forest experience and psychological health benefits: the state of the art and future prospect in Korea

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Abstract The aims of this study were twofold: to examine the empirical evidence supporting the positive contribution that a forest environment can make on human psychological health and well-being and to describe the theoretical framework within which the forest environment has this effect. Our review of the literature provides empirical evidence that a forest experience can contribute to improved emotional and cognitive health. This experience can be through a forest activity program and by experiencing the social and physical conditions of the forest environment and the therapeutic elements of the forest. Visiting or viewing a forest scene has been documented to have a positive effect on psychological healing and well-being in terms of recovering from stress, improving concentration and productivity, improving the psychological state, particularly for people from urban environments. Wilderness and related studies clearly demonstrate that being in a forest environment has a positive effect on people, while results from other studies indicate that contacts with forest environments provide multiple positive physiological and psychological effects on human health that included decreasing the blood pressure and heart rate and reducing anxiety and stress. There are several theories explaining the healing effects of the forest on human beings. Most hypothesize that restorative environments are settings in which recovery is associated with the reduction of stress and that the benefits of contact

with nature include a wide range of positive physiological and psychological responses. These theories are based on an evolutionary perspective and share a number of similarities and differences. This article summarizes a number of these theories of restorative environments as well as addresses the current status of forest therapy and the challenges and opportunities for therapeutic effects of the forest in Korea.

Keywords Forest benefits · Forest experience · Psychological outcomes · Therapeutic values of forest

Introduction

The world has become an urban society with a vast number of people becoming alienated from the traditional people–nature relationship. To combat this problem, many urbanites have sought out the forest setting to search for a different perspective from city life. A forest experience is considered one approach to promoting balance and harmony in the modern urbanite’s life, and the forest environment has been described as “a great health machine” [1], with forest activities cited as providing both preventive and therapeutic health benefits [2]. Extensive research has provided empirical evidence that a forest experience or the viewing of forest scenes contributes to reducing stress, promoting more positive moods and feelings and, possibly, may facilitate recovery from illness [3–8].

The therapeutic effects of a forest can be considered to be the results of a health treatment in a forest environment. It is possible that a forest may provide opportunities which foster the establishment of more efficient and active behavior, thereby enhancing mental and physical health and psychological functioning. Most of the studies carried

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out to date [3–8] appraised the values of forest-related clinical programs in improving the effective performance of delinquents, in- and out-patients of psychiatric institutions, including emotionally disturbed children, alcohol abusers, or people with other clinical mental health problems.

Programs that include forest therapy are being increasingly sought out in Korea within the framework of the trend of Life of Health and Sustainability (LOHAS) [52–54]. To combat this social demand, the Korea Forest Service launched the Forest for Human Health project in 2007 (e.g., development of a model forest for human health). However, there are many questions concerning just which therapeutic effects occur to an individual during his/her forest experience of forest and how these effects enrich individual health. As yet, there have been no attempts to answer these or similar questions empirically in Korea. The aims of this study were, therefore, to examine the empirical evidence for the positive contribution of a forest environment to an individual's psychological health and well-being and to describe the theoretical framework within which the forest environment has this effect.

Forest experience and psychological health benefits

Based on their analysis of empirical studies on forest use, Driver et al. [9] and Ewert [1] organized forest benefits into several categories, including psychological, social, educational, physical, and intrinsic benefits. The taxonomy of wildness benefits, according to Driver et al. [9], takes a broad view, while Ewert [1] focuses more narrowly on the personal benefits of forest adventure recreation. Ewert's use of the words "potential benefits" is similar to the words of "probable benefits" used by Driver et al. [9]. These two studies are recognized as the first comprehensive up-to-date literature review of this topic and includes reviews of structured and non-structured forest programs. Although these studies present well-classified categories of forest benefits based on a review of earlier investigations, the authors tend not to provide detailed information on each study in their respective review, such as the purpose of the study, the population and location of the study, the methodology and assessment instruments used, an overview of the results, and comments on the weaknesses and strengths of each study.

The conclusions reached by Ewert [1] are essentially the same as those reached by Driver et al. [9], even though they use different terms: (1) tremendous untapped opportunities for benefits are likely to exist; (2) users' willingness to pay (intention to pay more) for forest preservation attest to the sizable benefits which users believe they derive from the experience. This is not surprising since many of the studies

reviewed by these researchers came to the same conclusions. Ewert and Driver et al.'s studies suggest the need for further research aimed at identifying the limitations to the benefits documented to date. These limitations include: (1) the as yet unidentified benefits of forest, and (2) the often experienced impossibility to discern whether the benefits reported or inferred can be uniquely attributable to the forest experience [10].

What beneficial psychological gains occur to an individual during his or her experience of forest, and how might this interaction with forest benefit the shaping of a developing personality? Does an individual's experience of forest offer an enriched perspective on life? These and similar questions have recently been drawing the attention of many researchers.

Empirical studies on the psychological effects of a forest cover a variety of uses, subject populations, and outcome criteria. Studies which perceived changes in the psychological well-being of forest users can be placed into one of two categories: studies on participants in sponsored forest challenge or survival programs, and studies on general forest users. The results from the former confirm that changes do actually occur in the psychological well-being of an individual as a result of a forest experience. However, most such studies do not reveal anything about how and why the changes occur. Just how and why does the forest experience result in various positive personal changes?

In addition, most research has not investigated the individual-forest relationship itself. Perhaps, paradoxically, in some of these studies, there has been little suggestion that it is the forest itself that is the essential catalyst for psychological well-being. Of course, there must be some outcome from the relationship between man and forest, but the issue is much more than merely whether the forest has provided positive benefits or negative benefits. Instead, Driver et al. [9] pose questions such as: What are the specific dimensions or nature of forest-related benefits? Of what extent and magnitude are those benefits? Of what relative importance are they? Why should we care about these issues?

How the forest experience shapes psychological well-being

How, then, does the forest experience shape and develop psychological well-being? As Peterson [14] and Scherl [10] stated, there have been very few attempts to explain "how" and "why" a forest experience promotes psychological well-being. Gibson [15] also concluded from his comprehensive literature review on forest therapy that there was no generally accepted theoretical formulation for how forest programs bring positive changes in participants'

psychological and social functions. Kaplan [16] and Scott [17] pointed out that there has been more research on user characteristics, environmental perception, and types of use, than on the psychological well-being of forest or what aspects of the forest environment contribute to the purported psychological well-being.

Previous studies [18–20] have presented evidence that there is a great diversity in users' use patterns, activities, management preferences, and perceptions toward the forest. A basic question is, therefore, how this diversity affects the user's experience of the forest and the resultant psychological outcomes. There has been no attempt to relate this diversity to self-actualization, although previous studies do confirm that there are some relationships between self-actualization and forest use. For example, differences in the user's attitude to the forest may influence differentially the user's psychological outcome from a forest experience. The experiencing of various environmental conditions is conceptualized not as a static event but as a dynamic interaction, mediated by differences in psychological make-up and in how information is processed [21, 22]. Based on this conceptualization, it is possible that different forest settings may provide very different specific psychological outcomes. Information on such questions would be very useful to forest managers as the basis for inventory, planning, and management of different forest environments; in this context, different management strategies would apply for an old growth forest versus a forest seashore or a high alpine meadow. In the discussion which follows, the focus is on the theoretical frameworks which may provide guidance to a better understanding of the psychological processes which underlie the interactions between an individual and a forest setting.

Forest stimuli

Forest stimuli have been suggested [23] as an explanation of the role of forest in improving psychological well-being. Forest stimuli, as opposed to urban stimuli, include a low density of human population, low levels of noise and movement, and a slow rate of change. Therefore, according to Bernstein [23], forest stimuli provide a high degree of predictability and little that is conflicting or ambiguous. Lazarus [24] argues that one is often bombarded with threatening or stressful stimuli in the urban setting. In contrast, the forest setting tends to evoke coping behavior, in which one deals with a threatening or stressful stimulus either by handling it or by avoiding it. The copying behavior evoked in forest users tends to be such that there is a potential for positive psychological changes. Coping has been referred to as strategies for dealing with a threat

[24]. Murphy [25] explained coping in an analysis of how young children meet some of the demands and crises in their lives as follows:

“It is possible that by watching children, we may learn something about how all of us deal with new demands and established habits of ready-made answers. When responses are not automatic, when we do not know just what to do, we have to cope with the situation as best we can, trying to arrive at a solution that will enable us to get along. Much of what we call ‘getting experience’ consists of just this, and out of these efforts to cope with new situations eventually develops a certain know-how, patterned ways of dealing with newness itself [25]”.

Lazarus [24] suggested two general classes of coping reaction patterns. One consists of “action tendencies aimed at elimination or mitigation of the anticipated harmful confrontation that defines the threats”. According to Lazarus [24], faced with an external danger, an individual can take steps that reduce the threat by directly influencing the actual conditions of the threat. On the basis of an appraisal of the danger, energy is mobilized and mounted against the threat. If such attempts have failed or have placed the individual into further danger, a variety of negative consequences may ensue, including depression, fear, guilt, among others. If the attempts are successful, the threat has been mastered, thus leading to a positive feeling of achievement.

The second class of coping proposed by Lazarus [24] is “defense mechanisms”. He argued that defenses are psychological maneuvers in which the individual deceives himself of herself about the actual conditions of the threat. Defense is conceived as a response to a threat whereby the individual maintains a sense of a secure self by denying or distorting the threatening experience [24]. A defensive reaction does not resolve the threat [26]; the threat may still be present, although it may be denied or distorted (usually minimized). Haan [27] felt that coping mechanisms are healthy while defense mechanisms reflect inadequate or pathological ways of dealing with a threat. The distinctions between coping and defense mechanisms are listed in Table 1.

Defensive relations are common in settings where the “social environment” is dominant. Social environment includes not only individual and societal expectations and norms, but anything which tends to remind one of social constraints, such as buildings [23]. In contrast, in the forest, no social constraints exist (or at least they are far less evident). The forest setting, therefore, tends to provide opportunities for coping behavior instead of defensive behavior. Of course, the forest itself can be very much a threat (for survival, for example), but the forest experience may in fact be sought for, in part because the very existence of such threats challenge the individual's coping

Table 1 Analysis of properties of defense and coping mechanisms

Defensive mechanism	Coping mechanism
Behavior is rigid, and stimulus bound	Behavior involves choice and is thus flexible and purposive
Behavior is pushed from the past, and the past compels the needs of the present	Behavior is directed toward the future and takes account of the needs of the present
Behavior is essentially distorting the present situation	Behavior is oriented to the reality requirements of the present situation
Behavior involves relatively more primary thinking processes, has unconscious elements, and is thus undifferentiated in terms of responses	Behavior involves secondary process thinking, conscious and preconscious elements, and is highly differentiated in response
Behavior operates under the assumption that it is possible to remove disturbing affects magically	Behavior operates within the organism's necessity of "metering" the experiencing of disturbing affects
Behavior allows impulse gratification by subterfuge	Behavior allows forms of impulse satisfaction in an open, ordered, and tempered way

ability. Whereas the social environment may place the individual in an involuntary position where a defensive reaction may be the reaction to a threat, a forest environment places the individual in a voluntary position where the challenge of the forest evokes coping behaviors.

The concept of ‘flow’

Csikszentmihlyi’s “flow” is the central concept of his theoretical model for enjoyment. Csikszentmihalyi [28] described the flow experience as one of the complete involvement of the actor with his or her activity. In the flow state, action follows upon action according to an internal logic that seems to need no conscious intervention by the actor. Csikszentmihalyi [28] identified a number of elements that are indicators of the occurrence and intensity of flow experience: the perception that personal skills and the challenges provided by an activity are in balance, concentration of attention, loss of self-consciousness, unambiguous feedback to a person’s actions, feelings of control over actions and environment, momentary loss of anxiety and constraint, and enjoyment or pleasure [28].

According to Csikszentmihlyi [28], “flow” is a peculiar state of experience in the context of an intrinsically motivating activity. He used the term “autotelic” experience as a psychological state, based on concrete feedback, which acts as a reward in that it produces continuing behavior in the absence of other rewards. “Flow” as a specific state associated with “autotelic” activities happens when an organism’s capabilities match the level of demand of the situation. When a person believes that his or her opportunities to act are too demanding for his or her capabilities, the resulting stress is experienced as anxiety. When the ratio of capabilities is higher, but the challenges are still too demanding for his skills, the experience is worry. The state of flow is felt when opportunities for action are in balance with the actor’s skills. The experience is then autotelic. When skills are

greater than the opportunities for using them, the state of boredom results. This state again fades into anxiety when the ration becomes too large. One important aspect of this model is that either excessive boredom or excessive worry can be very stressful, leading the individuals to experience anxiety. In the “flow” state, there exists no worry or boredom, and a person feels a holistic sensation of acting with the total environment. One feels in control of one’s actions, and the distinction between self and the environment is blurred. Csikszentmihlyi [28] presents four characteristics of the state of flow: (1) a person in flow has no dualistic perspective, i.e., he/she is unaware; (2) attention is focused on a limited stimulus field; (3) there is a “loss of ego”, a “self-forgetfulness” while in flow; (4) the flow experience needs no goals or rewards external to itself. These four characteristics of the flow state can be applied to a person in forest. When a person is in a forest environment, he or she may possibly be subjected to “forest stimuli” or be struck by the greatness and mystery of the forest. When in a state of “flow”, he or she may forget about society and, by means of communing with nature in the forest, possibly reach a state of inner peace and serenity, that may resemble some states experienced during a religious experience.

Allen [29] tried to connect Csikszentmihlyi’s “flow” experience of adventure or risk recreation activities with Maslow’s “peak-experience” theory (this theory will be discussed in detail in the following section). Risk recreation may be defined as recreational or leisure activities that entail an exposure to danger. A forest experience may take on the attributes of these risk recreation activities. In fact, a natural environmental setting is important to the element of adventure or risk. This natural environmental setting includes features such as air currents, gravity, mountains, white water, ice and snow, and forest [29]. It may perhaps be best exemplified in a forest environment where the absence of man-made features may be conducive to an easier, and deeper awareness (and understanding) of the various features of the natural environment.

Several studies have examined flow or elements of flow during leisure experiences. Kleiber et al. [30] studied the experiences associated with the leisure activities of adolescents. The activities were grouped into three conventional categories, such as productive activities, maintenance activities, and leisure activities. These researchers reported that behavioral activities sampled during leisure (free) time were indeed experienced as being more intrinsically motivating and less restrained than those sampled during productive and maintenance activities; the former were also associated with more positive feelings. This study indicates that, for adolescents, leisure is distinctive in its association with high levels of perceived freedom, intrinsic motivation, and positive effects. Mannel et al. [31] carried out a study to determine if a higher level of flow accompanies activities perceived as freely chosen and intrinsically motivated. They reported that freely chosen activities were accompanied by experiences with higher levels of positive effects, potency, concentration, and lower levels of tension. Also, personal skills were more often perceived to match the challenges provided by the freely chosen activities.

The forest experience can certainly be characterized as an activity very likely to produce “flow”. It is associated with high levels of perceived freedom, intrinsic motivation, and positive affects. The forest experience provides a specific state of experience that is not accessible in everyday life. It is typically not boring and does not produce anxiety, feelings which are often produced in normal, everyday life. According to Csikszentmihalyi [28], the clearest sign of flow is the merging of action and awareness. A person in a flow state has no dualistic perspectives: he/she is aware of his/her actions, but not of the awareness itself. A forest rock climber may be too involved to think of anything separate from his/her immediate actions and does not see him/herself as being separate from the activity.

The main motivations of forest users appear to be desires to escape from normal life and reduce stress [6]. When in a forest, memory inputs (i.e., stimuli which may cause us to think about many distracting things) have been severed. The world seems to be cut off from the forest visitor, and the forest experience is conducive to thoughts on the mystery of nature, the beauty and greatness of nature, and God’s power. Such contemplation may be the result of the centering of one’s attention on a limited stimulus field, as when in a state of flow. Applying the concepts of Maslow [32], the wholeness of a forest experience is striking in that there is a total focus of attention on the forest, resulting in the individual being completely absorbed and possibly entering a self-forgetful state associated with an unawareness of time and space. Scott [17] also suggests that the forest provides opportunities for such self-forgetful states. During the forest experience, a person

is close to nature and often may feel that he/she has been cut off from the human world.

Consequently, the concept of “flow” is helpful to understand why forest users choose the forest as their recreational setting, how forest experiences affect the recreational setting, and how forest experiences affect the psychology of the forest user. However, it falls short of explaining just how the state of flow is attained. According to Csikszentmihalyi [28], flow is an explanation of how an activity may motivate and stimulate an individual, in contrast to how an activity may be boring or may produce anxiety. This concept focuses heavily on the relationship between an individual’s action capability and action opportunity, i.e., how capable is the individual to carrying out an activity and to what extent does an activity present the individual with an opportunity to act-out this capability. Flow is graphically portrayed as a balance between the opportunity for action and the personal skills that are called for in the activity. If a person’s skills are insufficient to meet the challenge of the situation, worry is produced. Conversely, if the scope of one’s skills is greater than opportunities for using them, he or she may experience boredom.

The “flow” model, however, does not take into account environmental influences on an individual’s psychological well-being. According to the flow model, a forest experience would be considered a challenge, resulting in flow provided that the individual has the skill (training, education, awareness) to cope with the challenge. To the unskilled, the forest may be highly boring or highly anxiety-producing. One needs “skill” (training, education, awareness) to appreciate a forest and to be able to be attuned to a forest. Outward-bound programs stress “personal growth through challenge” [33] and instill the requisite skills in participants to enable them to achieve personal growth through the challenge of a forest experience.

Hendee–Brown model

Hendee and Brown [34] developed a model to help people understand how to use the forest and other natural environments for their own greater inspiration and benefits. This model is also designed to increase the understanding of resource managers on how to manage natural environments so that they can contribute to the development of human resources. The main question for Hendee and Brown was “how does a forest work?”. They argue that the probabilities for personal growth from a forest experience depend on: (1) the participants being in a receptive mood; (2) the optimal degree of stress from forest activities; (2) contact with the environment; (4) a forest experience that

provides change and attunement; (5) opportunities which foster an increase in the awareness of desirable qualities that can later be applied back home.

Hendee and Brown [34] describe a process, an unfolding awareness in increasing depth, that can occur through forest activities. First, forest experiences increase an individual's personal awareness of basic patterns of feelings, behaviors, values, and beliefs, as the first step toward personal growth. Second, forest experiences place the individual at a "growing edge" (i.e., a psychological state of mind) where these personal qualities can be evaluated, and change can be initiated. Third, forest experiences in groups provide social interaction at a basic human level. In a forest, enhanced trust among interdependent companions can reduce the risk of self disclosure, and patterns of social interaction that are functional, effective and inspired can be developed and shared [34]. Lastly, the stumbling primal influences of a forest foster a sense of humility in relation to the natural world.

Hendee and Brown [34] argue that their model is a valuable road map for the designers of forest programs in that it would increase the understanding of forest managers so that they can better protect and foster opportunities for the effective use of the forest for the personal growth of participants in the forest programs and for the development of human potential.

The theory of Hendee and Brown takes into account broad aspects of nature–individual interactions, including natural environment influences and social interactions among the group participants. However, their postulates and hypotheses are mostly based on speculations, perhaps derived from their professional experience with forest users. Although their theory is quite convincing, further empirical study is needed to better support their hypotheses.

The model of crowding and privacy

Almost all studies on the motivation(s) of forest users mention the desire for a reduction of urban stress as a reason for a forest trip. Driver [35] states that forest areas provide opportunities for coping with crowding. He postulates that crowding contributes to the environmental stress felt in everyday urban living and that forest experiences become an important means of temporary escape and recovery for people under stress. He reported that about 50–70% of forest users generally mentioned "peace and tranquility", "getting away from city" or "from it all" and a "change from routine" as reasons for visiting forest areas. In other studies, forest users used different terms to describe their motivation(s), such as "solitude" [36, 37], "get away from the crowds and congestion of the city"

[38], "escape from frustrating or boring work" [6], and "escape from routine, the familiar, and urban stress" [39], but all of these findings were highly consistent and seemed to support Driver's idea about the stress-mediating or psychological value of the forest.

Crowding is a concept closely related to privacy. Crowding is felt when the privacy-controlling mechanisms fail, resulting in more social interaction than is desired [40]. The terms "density" and "crowding" are two different things, with density referring to a number of people per unit, while crowding is a psychological concept since it is personally experienced. Thus, the concept of "density" regards people simply as a number in relation to an area and does not consider subjective reactions to the presence of others. The point at which a specific level of density is considered to constitute crowding is both culturally and individually determined.

Hammit and Brown [41] proposed a theoretical model of crowding. According to this model, a person combines influences of personal factors, interpersonal forces, and situational conditions. The individual then attempts to achieve the desired degree of privacy through various privacy-controlling mechanisms. Following these efforts, he/she then evaluates the effectiveness of these mechanisms and decides whether the achieved privacy equals the desired privacy. If what is achieved is less than what was desired, crowding occurs; however, if what is achieved is much more than what was desired, a feeling of social isolation may result.

The forest is an environment that is particularly valued for the solitude and privacy it offers. The U.S. Forest Act states that opportunities for solitude are an important characteristic of a forest. Hammit and Brown [41] argue that forest solitude is generally recognized to include realms of privacy other than just being alone. These researchers did [41] acknowledge that privacy is a broadly defined terms and suggested that solitude, intimacy, anonymity, and reserve are four basic dimensions of privacy. Solitude refers to the complete isolation of an individual in which the latter is separated from the group and freed from the observation of others. Intimacy is a dimension of privacy and refers to the individual acting as part of a small unit, seeking to achieve a close, personal relationship with one or more selected members of this group. Anonymity refers to the individual in a public setting but still seeking and achieving freedom from identification, surveillance, and social roles. Finally, reserve refers to the individual keeping a mental distance, creating a psychological barrier against unwanted intrusion and reserving the right not to reveal certain aspects him/herself.

These four dimensions of privacy result in four functions, which are defined as personal autonomy, emotional release, self-evaluation, and limited and protected

communication [41]. Personal autonomy is the need to avoid being manipulated or dominated wholly by others, or to safeguard one's sacred individuality. Emotional release provides for a respite from the psychological tensions and stresses of social roles in every-day society. Self-evaluation refers to the need to integrate one's experiences into a meaningful pattern in relation to external events. Limited and protected communication provides the opportunities needed for sharing confidences and intimacies with those trusted, and it serves to set necessary boundaries of mental distance in interpersonal situations.

Hammit [41] and Hammit and Brown [37] examined the theoretical model for its utility in gaining an understanding of the functions of privacy in forest settings. Their findings indicated that forest environments and privacy were particularly important for "resting the mind from anxiety and mental fatigue" and for promoting a sense of "tranquility and peacefulness". Privacy in the forest allows for emotional release and for resting the mind from anxiety and mental fatigue. Privacy frees the mind of routine events and allows an attentional state to develop where reflective thought, self-evaluation, and the integration of events take on importance.

From the theoretical perspective, there are a number of profound complexities in these underlying processes that illustrate the large number of factors and dimensions which could be taken into consideration when studying forest experiences. It is important to note that a basic information processing paradigm is implicit in most of the theoretical models relating to interactions between an individual and his/her setting (environment) [10]. The experiences encountered in everyday life contrasts with the experience in a forest environment. In a forest situation, the individual experiences unambiguous feelings and has a very clear set of "challenges" which require a single-minded investment of energy and attention [1]. There is a directness and frankness associated with the feedback from a forest, which results from individual–environmental transactions in a forest situation [10].

The theories reviewed here have primarily emphasized mechanisms between an individual and his/her environment or those mechanisms for coping with stress. The theory of "forest stimuli" by Bernstein [23] focuses on the interactions between the individual and the extraordinary effects of forest environments. In the "Flow" model [28], specific characteristics of the activities are considered to be the most important factor. In the theory of 'Flow', other factors, such as environmental effects, which influence psychological well-being, should also be taken into consideration. The Hendee and Brown [34] model arguably is the most comprehensive model designed to date that explains how a forest experience actually improves personal growth. In this model, various factors are taken into

account, including the individual's receptive mood prior to the forest trip or prior to taking part in a forest program, the primal influences of nature, and the social interactions with other participants. The Hendee and Brown [34] model is very broad and consists essentially of postulates and hypotheses based on the experiences reported by forest users. The model needs to be tested under actual field conditions.

The concepts of solitude and privacy further complicate our understanding of how a forest may influence the individual. However, the issue of solitude and privacy in a forest setting should not be considered to be very different from that of solitude and privacy in general, such as in an urban setting. Although the motivation of many forest users is to seek "opportunities for solitude", the uniqueness of forest experiences calls for a more forest-specific theory of solitude, perhaps even to give it a different label. One can find solitude in one's house, but in terms of solitude, this is absolutely not the equivalent of forest solitude; perhaps solitude in forest may more appropriately be referred to as serenity.

This section has presented a review of selected social and environmental psychological concepts and theories which may facilitate an understanding and conceptualization of the forest experience. Theoretical frameworks which look at the nature of forest experiences in an all-encompassing way are nearly non-existent, and perhaps even impossible to construct. The most crucial conclusion that can be drawn from these diverse concepts and theories is that they are not significantly different from one another in terms of their applicability to understanding the forest experience. Quite to the contrary, a duplication and repetition of themes (albeit using different terms) seem to be the main characteristic of all these theories and concepts.

Attention restoration theory

Attention restoration theory (ART) [2] proposes that exposure to nature, such as a forest, reduces mental fatigue or, more precisely, directed attention fatigue. A theory attempting to explain these effects was proposed by Kaplan [2]. According to Kaplan's ART, prolonged use of directed attention leads to the fatigue of neural mechanisms. The Recovery of effective functioning is enabled by settings that have certain key properties, such as "being away", "extent", "fascination", and "compatibility". These components refer to those key properties of forests that trigger mental processes or states contributing to restorative experiences [42].

An extensive number of studies have been performed to provide evidence for and support of ART. These studies include those of Kaplan [43], Korpela et al. [44], Kuo et al.

[45], Kuo and Sullivan [46], and Taylor et al. [47]. Some of the most compelling studies have linked the beneficial effects of forest with its effects on attentional capacity [48, 49] and on its mediating role for directed attention in the relation between forest settings and beneficial outcomes [46, 50]. An understanding of restorative person–forest transactions can be useful in environmental design, planning, policy, and management. The measurement of restorative qualities of person–forest transactions can also help in applying such understanding [51]. In summary, ART provides a set of potentially useful constructs for understanding various restorative outcomes realized by purposive individuals acting in forest settings.

Growing importance of forest psychological benefits in Korea

Like many modern societies, Korean society has urbanized rapidly during the last three decades. According to current statistics, more than 87% of the Korean population resides in urban environments. As society becomes urbanized, the forest becomes an important resource for the millions of urbanites seeking more quality in their life. Forests provide opportunities for active outdoor recreation as well as for quiet relaxation and an escape from daily urban stress [38].

Although evidence-based research has been conducted in recent years, Korea has a long history of forest use for human health purposes. Approximately 65% of Korea is forested land; therefore, people use the forest to promote and maintain their health. Herbal remedies, exercise, meditation, green forest showers, among others are traditional health-related activities in forests in Korea. The results of a recent national outdoor recreation survey indicated that more than 80% of forest recreationists in Korea mentioned “promotion and maintenance of health” were the main motivations for their visiting a forest [13]. Natural-being and well-being with nature are emerging issues in Korea. To combat the increasing demand of forest use for human health, research in forestry has recently become a major issue.

Research

Since the early 2000s, several researchers have published books dealing with the health benefits of forests, including include *Therapeutic Forest* [52], *Health Travel to Forests* [53], *Green Shower for Health in Forests* [54]; papers/technical reports have also appeared on this topic. One of the most significant events in the forest and human health area in Korea was the establishment of an interdisciplinary research group in 2005 named the “Forest and Health Forum.” The main objective of this Forum is to research

evidence-based health benefits of forest and release the results to the public. To date, there are 200 researchers in forestry, medical sciences, sports sciences, among others involved in the Forum.

Empirical studies on “forest experience and psychological health” also have been actively conducted. Since the 1990s, studies on various samples of the general population have been published in forestry journals; these have included such topics as forest campers and their self-actualization increase [5], forest experience and alcoholics’ depression [7], forest program and college students’ depression [8], campers in a national park and their place bonding [7], forest view from the window and office workers’ job satisfaction [53], and the urban forest user and psycho-social outcomes [38]. Most of the studies have reported that the people who participated in a forest program or interacted with a forest environment recognized positive changes in their psychological well-being.

Several evidence-based studies have been conducted as degree theses in the field of forestry. Lee [55] investigated the relationship between types of forests and people’s psycho-physiological responses. Her study indicated that a forest with water environment is the most favorite type of landscape and one that produces most positive psychological and physiological outcome (i.e., mood and feeling, alpha brain wave, blood pressure, etc.). Song [56] also conducted a thesis project involving 60 unmarried women in which she investigated the influence of a 3-month forest therapeutic program on depression and self-esteem among unmarried women. Using the experimental design of a treatment and control group, her results revealed that unmarried women who participated the program showed significant improvement in terms of their depression and self-esteem levels.

According to a published literature review, there are very few studies dealing with subjects who participated in non-structured forest programs. It is also important to note that no studies have as yet investigated the benefits related to off-site users or vicarious users. While some of the empirical studies were of questionable validity due to methodological shortcomings, such as a small sample size, it is clear that a forest can indeed provide opportunities for positive changes in the psychological outcomes. As several researchers [1, 9] have claimed, “we have discovered a black box; we know something works but we don’t know why or how” [1]. With further research, the forest as a unique natural setting in modern society will become better understood and better appreciated.

Current status

There are no statistics of the numbers of practitioners employing forest therapy due to the current absence of

professional organization. However, the Korea Forest Service recognizes the importance of the therapeutic values of the forest environment and is conducting long-term research projects with foresters, medical doctors, and professionals in related fields, such as landscape architecture, psychology, among others. The main purpose of these projects is to investigate the relationship between the forest and human health outcomes and, if there are positive relationships, the mechanism of this therapeutic function of the forest. The Korea Forest Service is also studying the development of practical forest therapeutic programs for clinical purposes.

Future

The forest as a resource of human health, especially psychological health, has faced and will face large challenges in the future. Korean society once placed its hope in forest therapy as an effective way of improving the quality of life. Although several new opportunities for such therapy have developed, the initial expectation has not been entirely borne out over time. Evidence-based tools and programs are urgently needed.

Conclusion

The results reported in this article offer considerable support for the importance of forest in psychological well-being. We have briefly reviews the literature on the field and demonstrated that forest environments not only are more desirable than urban scenes [43] but that they can also enhance stress recovery and restoration in a way in which urban scenes cannot [44–46]. Forest environments are not the only kind of restorative environment, but they seem to have numerous advantages over many other settings, and there is substantial support for forest settings being preferred as well as restorative [43, 51]. It also appears that even a very short opportunity to experience a forest setting can serve a restorative function [11, 12]. Thus, a forest experience provides a restorative experience, one that provides a brief respite to one's fatigue and stress.

The use of forests is becoming more complex, and the outcomes are becoming more significant to people, especially to urbanites. Psychological health benefits from forest use and experiences are important issues in Korea because the psychological strains in daily life are particularly serious at the present time, with major economic and cultural changes. Korea has undergone a enormous financial crisis during the past 10 years; furthermore, its cultural patterns are being rapidly Westernized. It is clear from our literature review that research on the forest experience and

psychological health benefits is at an early stage of development in Korea as well as the rest of the world. There can be little question that the priority and resources accorded to the forest in the future will be largely shaped by the extent to which sound research demonstrates that the forest environment can improve health outcomes.

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