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Accelerating the Nature Deficit or Enhancing the Nature-Based Human Health during the Pandemic Era: An International Study in Cambodia, Indonesia, Japan, South Korea, and Myanmar, following the Start of the COVID-19 Pandemic

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Abstract: In modern society, the opportunity to experience nature is separate from everyday life, requiring time and effort. Since the start of the COVID-19 pandemic, restrictions on freedom of activity and communication around the world have become a crisis, causing a nature deficit by accelerating the process of separation from nature. At the same time, the pandemic has increased people's motivation to return to nature, providing an opportunity to seek experiences and health recovery in nature. The authors conducted an international cross-sectional study in five Asian countries, investigating changes in the perception of recreational activities and health restoration in the natural environment, one of the many effects of the COVID-19 pandemic on human society. An online survey, completed by 524 respondents, has confirmed the efficacy of the SEM model, which includes COVID-19 stress, increased indoor activity, a preference for the natural environment, and the perception of health recovery. Although the five countries had different response values for each theme, the stress caused by restricted activities and communication during the pandemic was linked to a preference for natural experiences and the motivation to visit natural environments in all five countries, ultimately affecting perceptions of health recovery in nature. This study has shown that the COVID-19 pandemic, a disaster afflicting all human civilization, has changed people's perceptions by enhancing their preference for natural recreational activities and health. It has accelerated people's return to nature and fostered a positive perception of nature's ability to promote good health.

Keywords: international comparison; restoration in nature; nature motivation; COVID-19

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1. Introduction

COVID-19 was declared a pandemic nearly 100 years after the 1918 H1N1 influenza pandemic, which infected 500 million people worldwide and claimed an estimated 50 million lives [1]. Declared a pandemic on March 11, 2020 [2], COVID-19 is an extreme event, which has restricted activity and freedom of communication all over the world at the same time, causing tremendous shocks and changes in global human society, economy, culture, industry, and health [3–7]. The authors have conducted an international

comparative study in Cambodia, Indonesia, Japan, Korea, and Myanmar to investigate and analyze changes in stress, the preference for nature, outdoor recreational behavior, and the perception that forests promote health during the pandemic.

In July 2020, just after the outbreak of the COVID-19 pandemic, 1020 American adults took part in an online survey of outdoor recreation. Most respondents found it difficult to accept the risk of infection associated with recreational activities during the pandemic; their perspective led to an overall decrease in outdoor recreational activities and an increase in indoor activities [8]. This finding is relevant to the situation in which all national and state parks have been closed since the start of the COVID-19 outbreak. A significant decrease in physical activities among 1055 Canadian adults since the start of the pandemic has been reported [9], while a study of 3024 Vermont residents in the United States similarly found that most outdoor recreational activities, apart from basic walking, hiking, and gardening, were reduced due to COVID-19 [10]. Restaurants, gyms, parks, community centers, and other public places for social activity and recreation have been closed worldwide; patterns of work, school, and leisure activity have also changed significantly [1].

Most modern people live in cities. Since the Industrial Revolution, when urban residents became disconnected from the wilderness and nature, people have felt motivated to return to and experience forests and natural ecology [11]. In modern times, time spent in nature and green spaces has been recognized as a special experience [12]. Nevertheless, urban green space, which has functioned as urban residents' recreational open space, faces many challenges from capitalist-based commercial use [13–15]. These are the distortions provoked by capitalist urban regeneration processes of how urban renewal and regeneration have taken place, increasing urban sprawl [16,17].

Many recent studies have investigated the effects of recreational activities and time spent in natural environments on health and recovery. Research carried out in three European countries has explored people's satisfaction with recreational experiences and the perception that natural environments promote good health. According to this study, participants make little distinction between easily accessible urban forests and forests with beautiful wild landscapes, reporting the same forest-healing experiences in both places [18]. Members of the digital generation, who spend less time outdoors than other generations, have little experience of nature and are at risk of developing a nature-deficit disorder and hatred of nature [19]. Concerns raised by Sobel (1996) about hatred of nature and Louv (2012) about nature-deficit disorders may account for the return-to-nature movement, which criticizes the perception of infants and young people in modern society as glued to screens and uninterested in outdoor activities [20,21].

In the era of online virtual experience, which has accelerated after the fourth industrial revolution, researchers are conducting follow-up studies designed to overcome deficits in natural experience through direct exposure to and experience of nature [18,22]. Amid these trends, the COVID-19 pandemic and global restrictions on freedom of activity constitute a serious and critical issue, impeding efforts to ensure that present and future generations secure sufficient natural experience.

Research is being conducted to improve the natural environment and city design in the urban area, focusing on the recovery of human health after COVID-19 [23–27].

The present study investigates the relationship between the impact of the pandemic and the preference for natural environments and nature-based recreational behavior and health promotion. The background of this study, which underpins its hypotheses, is the question of whether separating people from nature accelerates and causes a nature deficit and hatred of nature—or a return to increased exposure to the natural environment and the desire for nature-based experiences.

This study investigates the relationship between people's changed perceptions and recreational behaviors, health recovery in nature, and outdoor activities and behaviors. The main hypotheses are as follows: (i) in five Asian countries, economic stress, caused by economic shocks and reduced work and business income during the pandemic, can be observed; (ii) freedom violations, including restricted activities, have caused mental stress;

(iii) increased indoor time and limited freedom of travel have increased the preference for natural, ecological environments (a return to nature); and (iv) there is a significant relationship between health recovery and health awareness in the natural environment. In Figure 1, a Structural Equation Model (SEM) is used to show the flow of the research design. "Preference for Nature," a positive change in perception and a preference for the natural ecological environment, is influenced by exogenous variables caused by the pandemic. "Increased stress" is an exogenous variable, with observation variables, such as household economy, freedom of activity, interpersonal relationships, and face-to-face communication. "Indoor activity" is an exogenous variable associated with observational variables, including screen-exposure frequency, viewing time, and increased online activity due to more time spent indoors. "Experience in nature" includes visit frequency and time spent as aspects of the natural experience duration, while "health in nature" is associated with higher expectations and a more positive perception of health maintenance and restoration in natural environments since the start of the COVID-19 pandemic. The present study thus presents the hypothesis that the increase in "preference for nature" affects "experience in nature" and "health in nature" by interpreting them as an antidote to limited freedom and confinement [28]. The relationship between the variables is presented as an SEM model (Figure 1), along with the research hypotheses.

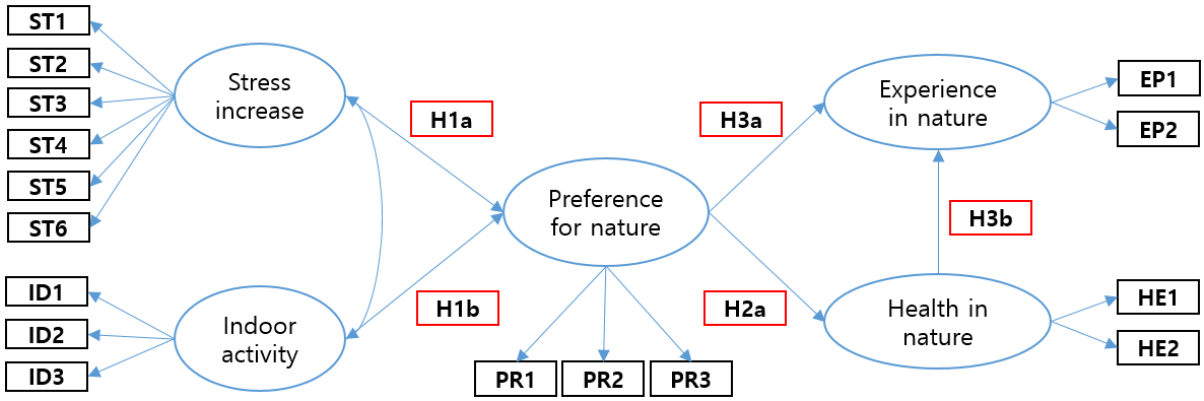

Figure 1. Structural Equation Modeling Diagram.

Since the start of the COVID-19 pandemic, we hypothesize the following:

Hypothesis 1 (H1). *People's preference for nature is a consequence of increased stress and indoor activity.*

Hypothesis 1a (H1a). *Increased stress is positively related to an increased preference for nature.*

Hypothesis 1b (H1b). *Changes in people's levels of indoor activity are positively related to an increased preference for nature.*

Hypothesis 2 (H2). *The perception that nature restores human health is due to an increased preference for nature.*

Hypothesis 2a (H2a). *The preference for nature has a significant relationship with the perception that nature restores health.*

Hypothesis 3 (H3). *Changes in people's behavior when experiencing nature are due either to an increased preference for nature or to the perception that nature restores health.*

Hypothesis 3a (H3a). *The preference for nature has a significant relationship with experience in nature.*

Hypothesis 3 (H3b). *The perception that nature restores health has a significant relationship with experience in nature.*

2. Materials and Methods

2.1. Survey Procedure

The data were collected between 1 June and 8 July 2020, 3–4 months after various governments began to take countermeasures, including restrictions on international tourism, social distancing, and bans on gatherings, in accordance with the WHO pandemic declaration of March 2020 [2].

Targeting Cambodia, Japan, Indonesia, Korea, and Myanmar, as Asian countries, the present study initially aimed to conduct a field survey. However, people lost access to public spaces in the city centers, while urban forests and parks were off-limits or closed, due to pandemic restrictions [29]. In addition, few people were willing to participate in face-to-face surveys. To carry out this study, we therefore secured a list of subjects with the cooperation of researchers working in forestry-related departments of government agencies in each country. The subjects had participated in vocational education and experience programs and government campaigns in the fields of forest-product harvesting, forestry education, recreation, and tourism (Green-experience education program in Korea, Assistance for Post-Permit Social Forestry Training Program in Indonesia, Environmental awareness training program in Myanmar). Because face-to-face interviews were not permitted, telephone interviews were carried out in parallel with online surveys, using email and Google Survey. Before the surveys began, all potential participants were informed of the copyright conditions and research ethics considerations. They were assured that they had the right to refuse to participate or to end their participation at any time. Consent to all conditions was obtained. The target group was balanced by age and gender. Excluding entry errors and incomplete responses, a total of 542 responses were used in this survey (Table 1).

Table 1. General characteristics of the survey respondents in each country.

Country/Surveyed Area	Forested Area /% of Land Surface	Population (Thousands)	GDP/People ($)	Survey Respondents				
				Female/Total Respondents (%)	Age (%)			
					–29	–39	–49	50–
Cambodia/Phnom Penh	80,683 sq.km (45.7%)	16,718	1512	41/97 (42.3%)	64.9	20.6	10.3	4.1
Indonesia/Jakarta	921,332 sq.km (49.1%)	273,523	3869	61/103 (59.2%)	48.5	45.6	3.9	1.9
Japan/Tokyo	249,350 sq.km (68.4%)	125,836	40,113	59/96 (61.5%)	40.6	27.1	22.9	9.4
Korea/Seoul	62,870 sq.km (64.5%)	51,780	31,489	95/146 (65.1%)	31.9	30.4	28.8	8.9
Myanmar/Yangon	285,438 sq.km (43.7%)	54,409	1400	59/100 (59.0%)	55.0	15.0	25.0	5.0

(Source: World Bank 2020 and survey of target areas).

2.2. Survey Instrument and Statistical Analysis

With the pandemic as a context, the questionnaires investigated both financial stress—including the impact of the industrial economy and the decrease in income since the start of the pandemic—and the mental stress caused by the loss of freedom when face-to-face social activities and communication were curtailed. In addition, participants were asked whether they were increasing their use of screens, including monitors, TVs, and smartphones, due to spending more time indoors. A questionnaire explored the extent to which the preference for nature and the outdoors had increased, due to increased stress and changes in indoor activities. Finally, the researchers developed questionnaires to measure the

participants' usage behavior before and after the start of the COVID-19 pandemic and the restoration of their psychological and physical health in natural environments. Participants responded using a 5-point Likert scale. When the internal consistency of the questionnaire responses was evaluated, the Cronbach's α value was between 0.729 and 0.944, indicating reliability (Table 2).

Table 2. Questionnaire reliability by category.

Category	Items	Var.	Cronbach α				
			CA	IN	JA	KO	MY
Increased stress	I have decreased my economic activity since the start of the COVID-19 pandemic.	ST1	0.779	0.799	0.882	0.783	0.791
	I am uncomfortable with limited freedom of movement and activity.	ST2					
	I am uncomfortable having little contact with other people.	ST3					
	Since the start of the COVID-19 pandemic, communication with other people (apart from family) has decreased.	ST4					
	Since the start of the COVID-19 pandemic, communication with my family has increased. *	ST5					
	I have not had enough leisure activities since the start of the COVID-19 pandemic.	ST6					
Indoor activity	Since the start of the COVID-19 pandemic, my screen viewing time on smartphones, the Internet, and TVs has increased.	ID1	0.826	0.813	0.872	0.830	0.843
	Since the start of the COVID-19 pandemic, I have preferred online activities to offline activities (shopping, chatting, video meetings, etc.)	ID2					
	In general, I don't think it is a good idea to increase screen viewing time.	ID3					
Preference for nature	Since the start of the COVID-19 pandemic, I feel better when I go outdoors into a natural environment. *	PR1	0.894	0.850	0.944	0.853	0.829
	Since the start of the COVID-19 pandemic, it has become more difficult to go outdoors into a natural environment.	PR2					
	Since the start of the COVID-19 pandemic, I have been more inclined to go outdoors into a natural environment as part of my usual routine.	PR3					
Perception of health in nature	Since the start of the COVID-19 pandemic, I have started to think that the natural environment really improves mental health. *	HE1	0.858	0.729	0.867	0.895	0.829
	Since the start of the COVID-19 pandemic, I have started to think that the natural environment really improves physical health. *	HE2					

Note: * reversed items, CA: Cambodia, IN: Indonesia, JA: Japan, KO: Korea, MY: Myanmar.

The scale developed and used in the fieldwork was based on the academic literature on the psychosocial factors that influence outdoor recreation. These include awareness of risk [30,31], social norms [32], health benefits [33], and substitution [34]. The developed questionnaires were translated into local languages and used for the field survey; 14 statistically significant questions tailored to each country's culture and customs were ultimately selected. Reliability analyses of each country showed that all scales were reliable, with the Cronbach's α scores greater than 0.65 [35].

The relationships among variables applied to the collected data were analyzed using descriptive statistics, an analysis of variance, and structural equations. Both SPSS 22 and

AMOS 22 were used for the statistical programs. A confirmatory factor analysis (CFA) was carried out to determine the fitness of the measured variables and the characteristics of each category. Errors in the interpretation of research results involving multicollinearity is a common issue in regression and path analyses, which verify the influence relationship between measured variables [36]. The correlations between independent variables were verified to identify any errors related to multicollinearity in the interpretation of results.

A correlation analysis was performed to verify the multicollinearity of the independent variables, and a path analysis was conducted using SPSS and AMOS to verify the influence relationship between the measured variables. To analyze the reliability and validity of the constructs presented in the research model, the construct reliability (CR), average variance extracted (AVE), and covariance values for the measured variables were used.

3. Results

3.1. A comparison between Recreational Behavior and Changed Perceptions of Nature

In the initial research model, stress and increased indoor activities led to an increased preference for the natural environment. In line with this result, an increased interest in health and public health during the pandemic led to a preference for restoring health in a natural environment, causing an increase in outdoor activities (see Figure 1). However, the various governments implemented national-emergency-level regulatory policies and social distancing. In the case of Cambodia, Indonesia, and Myanmar, in particular, visits to urban forests and parks decreased significantly, due to the enforcement of strong travel restrictions during the pandemic (Tables 3 and 4). Government Decree No. 2 on 'Pembatasan Sosial Berskala Besar (PSBB)' of 31 March 2020, in Indonesia [37], 'Whole of Nation Approach' from 26 April 2020, in Myanmar [38], and the Cambodian government is also implementing high-strength bans [39].

Table 3. Pre- and post-pandemic comparison of visit frequency and time spent in the forest and natural environment (mean values).

	Visit Frequency			Time Spent		
	Pre-Pandemic	Post-Pandemic	t-Value	Pre-Pandemic	Post-Pandemic	t-Value
Cambodia	2.59	1.87	7.752 ***	3.42	2.07	11.340 ***
Indonesia	3.34	1.64	21.170 ***	2.58	1.88	8.237 ***
Japan	3.32	3.29	2.258	2.02	1.96	1.548
Korea	3.01	3.31	−4.509 ***	2.80	2.38	3.961 ***
Myanmar	3.58	2.48	9.950 ***	2.66	1.70	8.952 ***

Notes: *** $p < 0.001$.

Table 4. ANOVA of interview results and behavior (mean values).

	Increased Stress	Indoor Activity	Preference for Nature	Visit Frequency	Time Spent	Psychological Benefit	Physical Benefit
Cambodia	3.47	4.13	3.77	1.87	2.07	4.08	4.01
Indonesia	3.37	4.23	3.62	1.64	1.88	4.06	4.04
Japan	3.52	3.58	3.42	3.29	1.96	3.46	3.35
Korea	3.77	3.82	4.03	3.31	2.38	4.24	4.08
Myanmar	3.26	4.23	3.54	2.48	1.70	4.26	4.11
F-value	23.385 ***	33.424 ***	26.198 ***	110.081 ***	12.836 ***	22.156 ***	22.948 ***

Notes: *** $p < 0.001$.

Table 4 shows the average value and ANOVA results for each research topic in the various countries (Table 4). Levels of stress were highest in Korea, while Indonesia and Myanmar had the highest levels of indoor activity, including screen viewing, as a consequence of government regulatory policies. The preference for nature increased most in Korea, followed by Cambodia and Indonesia. When asked whether COVID-19 had

strengthened their awareness of the impact of nature on psychological and physical health, respondents from most countries gave positive answers. In particular, the response values were higher for psychological health effects, rather than physical health effects (Table 4). National differences in the responses to each subject were verified with high probability, revealing different results even across Asian countries.

In Korea and Japan, there were no restrictions on individual activities, apart from social distancing, mask-wearing, and a ban on gatherings. As Table 3 shows, respondents from these countries increased or maintained their forest visits after the start of the COVID-19 pandemic. However, in Cambodia, Myanmar, and Indonesia, the frequency of visits and the time spent in nature decreased significantly after COVID-19, due to national-emergency policies; these data were therefore judged to be inappropriate for analysis. As it was necessary to change the initially established research design and hypotheses, a revised SEM model was derived (Figure 2).

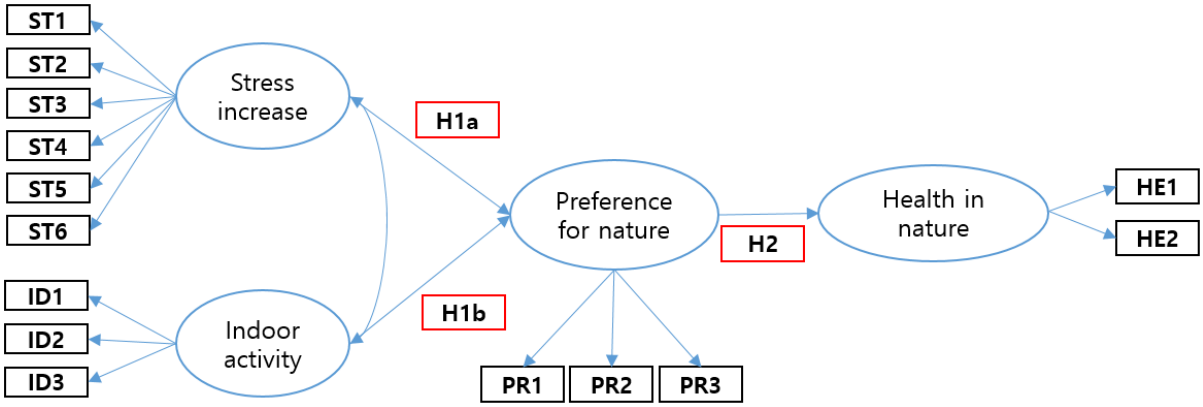

Figure 2. Revised Structural Equation Modeling Diagram.

3.2. Confirmatory Factor Analysis

A confirmatory factor analysis (CFA) was carried out to examine the variable validities (see Table 5). Before conducting a CFA of the full model, a CFA using operational concepts was implemented to eliminate redundant variables. Because all items within the operational concepts had high-enough R-square values, the validity concentration was considered good.

Table 5. Confirmatory factor analysis.

Category		Test Objects	Cambodia	Indonesia	Japan	Korea	Myanmar
Increased stress	ß-coeff.	ST 1	0.409	0.625	0.887	0.556	0.737
		ST 2	0.822	0.571	0.84	0.806	0.935
		ST 3	0.797	0.659	0.894	0.833	0.862
		ST 4	0.604	0.740	0.707	0.723	0.632
		ST 5	0.484	0.484	0.582	0.316	0.301
		ST 6	0.580	0.707	0.565	0.460	0.343
		CR	0.917	0.929	0.941	0.893	0.926
		AVE	0.632	0.689	0.732	0.602	0.705

Table 5. *Cont.*

Category		Test Objects	Cambodia	Indonesia	Japan	Korea	Myanmar
Indoor activity	ß-coeff.	ID 1	0.859	0.853	0.973	0.901	0.760
		ID 2	0.870	0.846	0.978	0.898	0.841
		ID 3	0.633	0.625	0.572	0.599	0.804
		C.R	0.922	0.947	0.960	0.906	0.948
		AVE	0.801	0.857	0.895	0.769	0.860
Preference for nature	ß-coeff.	PR 1	0.862	0.776	0.928	0.863	0.866
		PR 2	0.862	0.958	0.880	0.722	0.882
		PR 3	0.852	0.709	0.963	0.850	0.714
		C.R	0.947	0.947	0.973	0.922	0.948
		AVE	0.856	0.858	0.924	0.799	0.859
Health in nature	ß-coeff.	HE 1	0.940	0.921	0.894	0.928	0.429
		HE 2	0.843	0.624	0.857	0.873	0.859
		C.R	0.947	0.943	0.912	0.947	0.720
		AVE	0.900	0.895	0.838	0.900	0.588
Model fit summary		Chi^2	85.538	121.600	155.414	102.944	109.353
		p-value	0.115	0.010	0.001	0.008	0.039
		GFI	0.910	0.913	0.932	0.923	0.907
		AGFI	0.878	0.877	0.916	0.896	0.897
		NFI	0.936	0.942	0.955	0.948	0.929
		IFI	0.974	0.939	0.957	0.964	0.959
		TLI	0.966	0.919	0.943	0.953	0.946
		CFI	0.974	0.937	0.956	0.963	0.958
		RMSEA	0.046	0.065	0.061	0.056	0.056

ß-coeff.: Standardized coefficient, CR: Construct reliability, AVE: Average variance extracted.

The final exogenous variables were composed of six increased-stress items and three indoor-activity items. The final endogenous variables also included two health-in-nature items and three preference-for-nature items.

To examine discriminant validity, both construct reliability (CR) and average variance extracted (AVE) were estimated. The range of AVE values was as follows: above 0.7 = very good; 0.7–0.5 = acceptable; <0.5 = not acceptable. If CR > 0.7, CR > AVE, and AVE > 0.5 the data have convergent validity [40].

$$\mathrm{CR} = \frac{(\sum \text{standardized factor})^2}{(\sum \text{standardized factor})^2 + (\sum \text{Error variance})}$$

$$\mathrm{AVE} = \frac{\sum \text{standardized factor}^2}{\text{Number of items}}$$

As a result of the study model analysis, high CR and AVE values confirm the internal consistency and convergence validity of the study. The CFA for the full model suggests a moderately good fit with the data. The model fit test for each country is presented in Table 5. Most prior studies have focused on a single model per situation. By contrast, this study set out to design a single model for multiple conditions in five countries, categorized by exogenous factors (Table 5). In general, when the value of $\chi 2$ is small, and the probability value is large ($p > 0.10$), the model is considered suitable. The Chi-square indices of model fit were not accepted in Indonesia (121.600, $p = 0.010$), Japan (155.414, $p = 0.001$), Korea (102.944, $p = 0.008$), or Myanmar (109.353, $p = 0.039$), although they were accepted in Cambodia by 85.538 ($p = 0.115$).

The minimum and maximum indices for the five countries were as follows: goodness-of-fit index (GFI) = 0.862–0.903; adjusted goodness-of-fit index (AGFI) = 0.816–0.856;

normed fit index (NFI) = 0.824–0.895; incremental fit index (IFI) = 0.939–0.974; Tucker-Lewis index (TLI) = 0.919–0.966; comparative fit index (CFI) = 0.937–0.974; and root mean square error of approximation (RMSEA) = 0.046–0.065. The values for the GFI and AGFI statistics ranged between 0 and 1, and the recommended values were more than 0.90, indicating a good fit. A cut-off criterion of CFI, TLI and NFI $\geq$ 0.90 was initially advanced. RMSEA is an index of the difference between the observed covariance matrix per degree of freedom and the hypothesized covariance matrix that denotes the model [41,42]. It has been suggested that an RMSEA smaller than 0.06 indicates a relatively good model-data fit in general [43], or an astringent upper limit of 0.07 [44]. As shown in Table 5, all of the verified values satisfy the criteria, confirming that the structural relationship of the research model is good.

3.3. Structural Equation Model

The Structural Equation Model (SEM) was used to examine the hypothesis that there was a relationship between COVID-19 stress and health changes, brought about by an outdoor natural environment for the people of five Asian countries (Table 6). The Chi-square indices of model fit were not accepted in Indonesia (132.094, p = 0.001), Japan (182.907, p = 0.001), Korea (114.406, p = 0.009), or Myanmar (126,149, p = 0.051), although they were accepted in Cambodia by 87.320 (p = 0.121). The GFI, AGFI, NFI, IFI, TLI, CFI, and RMSEA model indices are shown in Table 6. The first hypothesis—about the relationship between "increased stress" and "preference for nature" as deterministic variables—was examined. The hypothesis that increased stress had a positive effect on a preference for nature was accepted, with a standardized coefficient of 0.242–0.672 (t = 0.927–1.857, $p < 0.05$), except in Myanmar (Estimate = 0.018, t = 0.162, p = 0.871). The symbolic meaning of increased stress in the COVID-19 era was significantly related to the preference for nature, which represented freedom in nature, fresh air, and forests in four countries: Cambodia, Indonesia, Japan, and Korea.

Table 6. Summary of hypotheses results and the model fit test.

Hypothesis: Direction		Cambodia	Indonesia	Japan	Korea	Myanmar
H1a: Stress → Nature	Estimate	0.562	0.672	0.242	0.338	0.018
	S.E.	0.173	0.171	0.110	0.152	0.149
	C.R.	1.857	1.254	1.290	0.927	0.162
	P	0.013	0.043	0.017	0.026	0.871
	Result	Accept	Accept	Accept	Accept	Reject
H1b: Indoor → Nature	Estimate	0.288	0.247	0.093	0.247	0.290
	S.E.	0.132	0.135	0.114	0.076	0.149
	C.R.	10.886	0.992	0.815	0.933	10.940
	P	0.044	0.318	0.415	0.040	0.042
	Result	Accept	Reject	Reject	Accept	Accept
H2: Nature → Health	Estimate	0.304	0.873	0.528	0.565	0.198
	S.E.	0.131	0.192	0.126	0.116	0.155
	C.R.	2.323	2.039	4.195	.974	.816
	P	0.002	0.041	0.000	0.000	0.045
	Result	Accept	Accept	Accept	Accept	Accept
Model fit test	Chi^2	87.320	132.094	182.907	114.406	126.149
	p-value	0.121	0.001	0.001	0.009	0.051
	GFI	0.908	0.909	0.928	0.921	0.901
	AGFI	0.870	0.874	0.915	0.890	0.893
	NFI	0.931	0.917	0.952	0.946	0.924
	IFI	0.972	0.924	0.954	0.954	0.944
	TLI	0.965	0.913	0.937	0.943	0.930
	CFI	0.973	0.925	0.951	0.952	0.941
	RMSEA	0.047	0.068	0.062	0.061	0.058

The hypothesis that indoor activity (including a changed indoor-oriented lifestyle that involved extra screen time (on smartphones, tablets pads, monitors, or TV) had a significant impact on the preference for nature was accepted in three countries: Cambodia, Korea and Myanmar, with a standardized coefficient of 0.147–0.290 (t = 0.933–1.940, $p < 0.05$). In this study, the limitations on outdoor activity, including face-to-face communication, were not interpreted negatively in Indonesia or Japan. We then examined the second hypothesis about the relationship between health in nature and a preference for nature. The level of anticipation about an experience in nature was significantly related to the likelihood of regaining a healthy life in nature in all five countries (t = 0.816–4.195, $p < 0.05$).

Table 6 summarizes the results of these hypotheses. The study has partially proven that COVID-19 stress caused a preference for nature-based experiences and positive perceptions of the natural environment in four countries. The limitations and bans on communication between people and a radical increase in indoor living time, due to COVID-19, eventually increased outdoor activities and a preference for nature-based experiences in three countries. The increased preference for outdoor natural environments and people's willingness to visit them helped to restore good health and promote awareness of the health-giving benefits of the natural environment. This was coupled with increased interest in maintaining good health, amid an infectious disease epidemic in all five countries.

The variable "preference for nature" intervened between increased stress, indoor activity, and health in nature. These results were examined to determine their statistical significance, using a Sobel test (Table 7). The test was applied to the study model, under the assumption that either "increased stress" or "indoor activity" affected "health-in-nature" intention.

Table 7. The indirect effect in the Sobel test.

Indirect Effect		Cambodia	Indonesia	Japan	Korea	Myanmar
Stress → Nature → Health	Z-value	1.888	2.973	1.947	2.022	0.120
	P	0.058	0.002	0.051	0.043	0.904
Indoor → Nature → Health	Z-value	1.589	1.697	0.800	2.703	1.067
	P	0.111	0.089	0.423	0.006	0.285

The variable "preference for nature" intervened between "Increased stress" and "health-in-nature intention" in Indonesia (p = 0.002), Japan (p = 0.051), and Korea (p = 0.043). However, the test shows that "preference for nature" intervened between "indoor activity" and "health-in-nature intention" in Korea only (p = 0.006). The Sobel test results show that, in three countries, "preference for nature", played a mediating role between "increased stress" and perceived recovery through "health in nature."

By verifying the research model, we found that the increased stress and concentration associated with indoor activities since the start of the COVID-19 pandemic had a positive effect on the preference for the natural environment and ecological landscape. Therefore, Hypotheses 1 and 2 were both adopted.

4. Discussion

4.1. Isolation from Nature during the Pandemic: Increasing the Nature Deficit or Nature Experience

From the Industrial Revolution, which was characterized by urban concentration, industrialization, and separation from nature, to the mid-to-late 19th century, when "green" nature represented a good quality of life, social interest in the return to nature has been found to motivate people to experience nature [11,12]. Recently, studies of human health in nature, carried out in Korea, Japan, and Europe, have investigated various academic research subjects, ranging from simple satisfaction with outdoor recreational activities to psychological health [17,18,45–49], physical health [50–52], and scientific brain health [53–56].

The system for qualifying to become a forest therapist is attracting high levels of social interest in Korea, Japan, Australia, and the United States [57,58].

The COVID-19 pandemic has significantly disrupted the flow of visits to natural environments, outdoor recreational activities, and natural healing. The pandemic can be defined as the second period of separation, following the separation from nature described by landscape ecology historians [11,12], following the Industrial Revolution. Just as nature-based education, including that introduced by Pestalozzi, Montessori, and Steiner [59,60], and nature-based healing concepts, such as those introduced by Kneipp [61], emerged after the Industrial Revolution, could a new paradigm of natural experience emerge after the COVID-19 pandemic?

Because every kind of face-to-face contact was forcibly restricted during the pandemic, many nature-based individual and group recreational activities also changed, as previous studies have shown [8,62]. In addition, the amount of time spent indoors increased significantly, causing many people to report psychological disorders, including feelings of isolation, depression, helplessness, and stress, due to limited communication and insufficient outdoor activities [63–66]. The increase in indoor life resulted in a passive and sedentary lifestyle spent reading, watching TV, playing games, and using smartphones [67–72]. Relatively few people engaged in indoor sports, despite some interest in indoor exercise and yoga [73].

As for the research question mentioned above—whether people experience a nature deficit when forced to focus on indoor activities or show a strong and clear determination to experience nature—this study can confirm that the citizens of five Asian countries responded with enhanced motivation to return to nature, immediately after the pandemic was declared.

Although they all belong geographically to the Asian region, the five countries have different religions, cultures, customs, histories, and GDP levels, making it difficult to interpret them as a single value. However, in the midst of the pandemic, people in all five countries expressed a clear desire to return to nature; this was the case without exception and beyond all differences, confirming previous research, which explained people's attachment to nature as a primal instinct [74–80] (see Tables 4 and 6).

The results of the present study suggest that human beings are unwilling to accept a forced separation from nature, due to disaster. Instead, they search for opportunities to return to nature and express a strong determination to experience nature.

4.2. Enhanced Enthusiasm for Nature-Based Human Health: Overcoming Isolation from Nature

Why do people long to experience nature in the midst of a pandemic? The threat of a widespread infectious disease and the many reported deaths cause them to focus on perceptions of health [81–83]. The present study argues that increased social interest in health is expressed as an interest in returning to nature to become healthier. The close relationship between a preference for the natural environment and human health in nature emerged in all five countries.

The findings show that the causes of an indoor-centered lifestyle, disconnected communication, and COVID-19 stress lead to an increased awareness of the health benefits of the natural outdoor environment, using an increased preference for experiences in the natural environment as a parameter (see Tables 6 and 7).

Although many previous studies have investigated health promotion in the forest environment [45–56], nature-based human-health research during the pandemic is distinct from earlier research. Various studies have considered the extent to which forest environments can promote good health. Some are studying various physiological effects, such as the increase in alpha brain waves in a calm state [55,56,84,85] or the decrease in cortisol, the stress hormone [86–88] during forest experiences. Additional research is exploring physical strength [86,89–92], using forest-based terrain therapy to build muscle endurance, bone density, and cardiopulmonary function. Studies are also investigating psychological

effects [47,55,93–97], such as stress, addiction treatment, self-efficacy, and psychological disorders, as well as general preferences and satisfaction [17,98].

During the pandemic, however, nature-based human health has not been simply a "nice" choice for everyday life; instead, its meaning has been reinforced as the only survival space [99]. This is because hospitals have focused on treating and screening confirmed patients [100–102] instead of working to ensure that all people can live safely.

The results of the present study resemble research conducted in Norway and the United States, showing that outdoor recreational behaviors have changed since the start of the COVID-19 pandemic, increasing awareness of the health benefits of forests [62,103,104];

According to a long-term follow-up survey of 64,000 people on the email list of the Leave No Trace (LNT) Center in the United States, social distancing during the COVID-19 pandemic has caused forest visits to increase by [62] and outdoor recreation frequency to increase by 43% among U.S. citizens [103], despite the closure of national and state parks, protected areas, and recreational areas and the suspension of many recreation programs under the federal government's "stay at home" order. In city parks and urban forests in Oslo, Norway, pedestrian activity increased during the pandemic, with urban nature acting as a form of escape from the stress caused by communication and activity restrictions [104].

In line with the results of previous studies, the findings of the present study reveal that people in all five Asian countries have been more willing to spend time outdoors, in the natural environment, since the start of the pandemic (see Table 4). The time spend experiencing forests has remained stable or increased since the start of the pandemic in Korea and Japan (see Table 3), although not in Cambodia, Indonesia, and Myanmar, where government policies limited access. In light of the results of previous research, this study argues that forests and natural environments serve as a strategy for survival and health recovery, alleviating the psychological shock caused by COVID-19 restrictions on communication and freedom.

4.3. Study Limitations

This study has three research limitations and suggestions for further research. An international comparison should consider the extent to which samples from each of the five countries represent their countries. When comparing countries, it is necessary to assess and understand how representative the samples of these respective populations are by assessing differences between sampling locations, as well as languages and translations. All of these variables and conditions can influence respondents. In the present study, we have not researched or analyzed the characteristics, customs, culture, or nature-related history of the five sample groups. In the future, an anthropological analysis of the five countries is needed. The industry impact of the pandemic is another big issue for urban life and human well-being [105–109]. Further study should be researched and analyzed with the industry impact as a critical variance.

In addition, the draft SEM model includes recreational behavior pre/post-pandemic; this changing factor includes forest-visit frequency, time spent in the forest, companion types, and other variables. In the survey of recreational behavior, however, the responses were predictably negative in three countries, due to government decisions. For this reason, the SEM model had to be changed to a simpler form, involving a narrower interpretation. In future studies, conditions in the five countries should be identical, making it possible to analyze the influence of the pandemic on both perception and behavior.

5. Conclusions

It is important to identify how the previously established roles and functions of the outdoor natural environment interact with people in a world in which industry, economy, and social paradigms have changed since the start of the pandemic. Changed attitudes toward the natural environment constitute a much-needed strategy for human life in a new world, shaped by COVID-19. This study has analyzed the relationship between the perception of and preference for nature-based experience and the perception of nature-based

human health in five Asian countries, immediately after the pandemic was announced, in response to various stresses associated with COVID-19. To this end, we have developed an SEM model and sought to prove the relationship between each factor.

The findings prove that the stress caused by COVID-19 leads to a preference for nature-based experiences in all five Asian countries; it is also related to the perception of nature-based human health. At the present time, it is difficult to predict a positive future, due to the emergence of various COVID-19 mutations. A completely new lifestyle is emerging, due to the restrictions on activities and freedom of communication.

Amidst these radical changes, the opportunity to experience a forest contributes to people's "quality of survival" (as opposed to "quality of life"). In addition, as the results of this study show, this crisis in human society has been interpreted as an opportunity for natural recreation and health promotion. This study can therefore serve as a basis for predicting a surge in demand for recreational and health-promotion activities in the natural environment after the pandemic is over.

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