

Article

Impact of COVID-19 Risk Perception on Residents' Behavioural Intention towards Forest Therapy Tourism

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Abstract: Risk perception has an important influence on tourism decision-making behaviour. Based on the extended Theory of Planned Behaviour, we examine the effect of COVID-19 risk perception on tourists' behavioural intentions towards forest therapy tourism. A questionnaire survey was conducted during the pandemic. Based on structural equation modelling (SEM), our evidence shows that cognitive risk perception positively and significantly influenced subjective norms, while affective risk perception positively and significantly influenced attitudes. Subjective norms mediated perceived risk perception and behavioural intentions, while attitudes mediated emotional risk perception and behavioural intentions. Gender partially moderated perceived behavioural control and behavioural intentions. Finally, this study proposes corresponding management countermeasures of great practical importance in promoting the development of forest recreation tourism.

Keywords: the extended theory of planned behaviour; COVID-19; risk perception; forest therapy tourism



Citation: Gao, Y.; Chen, L. Impact of COVID-19 Risk Perception on Residents' Behavioural Intention towards Forest Therapy Tourism. *Sustainability* **2022**, *14*, 11590. <https://doi.org/10.3390/su141811590>

Academic Editor: Anna Mazzi

Received: 26 July 2022

Accepted: 13 September 2022

Published: 15 September 2022

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1. Introduction

The study of the relationship between risk perception and tourism behaviour has been one of the hot topics in tourism behaviour research in recent years [1–5]. Risk perception has an important influence on individuals' attitudes and behaviours; with high perceived risk, individuals may adopt a conservative avoidance attitude and avoid certain risky behaviours, and conversely, will tend to certain attitudes and behaviours [6–10]. The current COVID-19 epidemic is still a global pandemic, and people's awareness of risk avoidance and health awareness is increasing [11]. Relevant supply companies are also actively taking safety measures to avoid the risks associated with the epidemic and to facilitate rapid consumer decision-making [12,13]. The epidemic has prompted a change in people's preferences for transportation modes and travel destination choices [14–19], with low-density travel options such as close-in suburban tourism, rural tourism, ecotourism, and forest therapy tourism being favoured [20–25].

Forest therapy has been a very popular health experience model in recent years, which is a business model for integrating forestry and wellness with good physiological and psychological relaxation effects [26]. Currently, research on forest therapy tourism focuses on the value and therapeutic effects of forest therapy tourism [27–30], forest therapy tourism base construction [31,32], product development [33], potential evaluation [34], and forest therapy tourism behaviour [35,36]. According to the health belief model, people who perceive their health to be at high risk tend to increase their participation in health-protective behaviours to cope with the risk [37–39]. There are no studies on whether perceived risk perceptions and emotional risk perceptions of COVID-19 affect potential tourists' willingness to engage in forest therapy tourism during an epidemic, and this study attempts to explore this issue.

The objectives of this study are to construct a model of the relationship between COVID-19 risk perception and behavioural intention for forest therapy tourism and to explore whether COVID-19 risk perception can facilitate potential tourists' behavioural

intention for forest therapy tourism. We also aim to test whether attitudes, subjective norms, and perceptual behavioural control mediate the relationship between COVID-19 risk perception and potential tourists' behavioural intention. The results of this study will extend the theoretical model of planned behaviour by introducing cognitive risk perception and affective risk perception to better understand potential tourists' risk perception of COVID-19 and how it affects their behavioural intention, thus enriching the research related to behavioural intention towards forest therapy tourism. The results also provide useful hints for destinations to strengthen risk management of epidemic prevention and control, establish a good safety image, and do a good job of promotion and marketing.

This article is structured as follows: first, we conducted a literature review on forest therapy tourism, theory of planned behaviour, and risk perception, as well as proposed relevant hypotheses for this study and constructed a conceptual model. Second, the data sources, sample collection, and research instruments of this study are presented. We validated the model using Amos 24.0 software of IBM (New York, NY, USA) discussed the results, and presented the theoretical and practical insights of this study. Finally, we discuss the shortcomings and provide directions for future in-depth research.

2. Theoretical Framework and Research Hypotheses

2.1. Forest Therapy Tourism

According to Mueller and Kaufmann, therapy tourism consists of the effort to obtain health through a series of tourism activities [40]. There have been many studies on forest therapy tourism, and these studies have focused on therapy effects [41–43], potential assessment [34,44], products [45,46], behaviors/behaviours [35,36], and base construction [47]. The vast majority of scholars understand the connotation of forest therapy from two perspectives: first, the therapeutic perspective, which focuses on the treatment of diseases [48,49]; and second, the therapy perspective, which focuses on relaxation, leisure, and escape from the routine [50,51]. Li Jiren et al., constructed an index system and used hierarchical analysis and a fuzzy comprehensive evaluation method to evaluate the development potential [52]. For therapy resources, scholars have explored the evaluation system and methods for the suitability of forest therapy resources based on therapy functions and therapy services. Liu Panyang et al., constructed an index system for calculating the evaluation value of four types of therapy activities, such as physiological health maintenance, psychological regulation, sports and fitness, and science education [53]. Due to the different resource endowments of forest therapy tourism, there is no fixed model for development, and the exploration of forest therapy tourism products is mainly based on the analysis of specific cases and problems to propose the corresponding development model or construction path [54]. Exploring the factors and mechanisms affecting forest therapy tourism behaviour is important for constructing forest therapy tourism bases and improving the diversity of destination product supply. Zhao J & An Y. found that the perceived benefits of forest therapy tourism and the perceived severity of COVID-19 had a positive effect on the behavioural meaning of forest therapy tourism and attitudes mediated health beliefs and behavioural intentions, while perceived barriers to forest therapy tourism and perceived susceptibility to COVID-19 were not significant factors [35].

Risk perception originates from the category of psychology and refers to the psychological feelings and perceptions of individuals about various objective risks [55]. People's perceptions of risk influence their behavioural decisions to adopt risk-averse measures or behaviours [56], and therefore, risk is an important antecedent for tourists when making destination choices. The COVID-19 epidemic has brought many uncertain risk factors to society, prompting people to re-examine their lifestyles and travel styles. People are more interested in health tourism forms such as medical tourism, contact-free tourism, and nature tourism [23,57–59]. Does COVID-19 risk perception affect residents' intention toward forest therapy tourism, and what are the pathways? This study focuses on these questions.

2.2. Theory of Planned Behaviour

The theory of Planned Behavior was proposed by Icek Ajzen [60] as an extension and complement to the Theory of Reasoned Action (TRA) [61]. Ajzen found that human behaviour is not 100% voluntary but is controlled. The model consists of five elements: attitudes; subjective norms; perceived behaviour control; behavioural intentions; and behaviour. Ajzen argues that all factors that may influence behaviour are indirectly influenced by behavioural intentions. Behavioural intentions are influenced by three related factors: the individual's attitudes, i.e., their "Attitude" toward adopting a particular behaviour; external "subjective norms," i.e., "subjective norms" that affect the individual's ability to adopt a particular behaviour; and the last is derived from "perceived behavioural control". In general, the more positive an individual's attitude toward a behaviour, the stronger the individual's behavioural intention, and the more positive the subjective norm for behaviour, the stronger the individual's behavioural intention. The more positive the attitude and subjective norm and the stronger the perceived behavioural control, the stronger the individual's behavioural intention will be.

The theory of planned behaviour has been widely used in various disciplines, such as education, psychology, consumer behaviour, and tourism [62–66]. In the field of tourism, it is mainly applied to behavioural research aspects, such as tourists' environmentally responsible behaviour, low-carbon tourism behaviour, rural tourism behaviour, ecotourism behaviour and study tour behaviour [67–69]. Many scholars have added other variables to obtain better explanatory power. For example, variables such as tourism experience, epidemic effects and environmental beliefs have been added to the model to better understand virtual tourism behaviour [70].

Behavioural intention towards forest therapy tourism is the degree of effort that tourists are willing to make to realise forest therapy tourism after learning about it. Attitudes towards forest therapy tourism are positive or negative, i.e., attitudes conceptualised by individuals in evaluating forest therapy tourism. Subjective norms refer to the social pressures tourists feel when deciding whether to participate in forest therapy tourism, which may come from family, peers, friends, etc. The stronger the positive subjective norms, the stronger the intention to engage in certain behaviours. Perceived behavioural control refers to the influence of the traveller's past experiences and anticipated future obstacles on their behavioural intentions, such as the time, money, and hardware facilities for forest therapy that the traveller possesses. The more resources the traveller has and the fewer the anticipated barriers, the greater the perceived behavioural control and the stronger the motivation for behavioural intentions. Based on the above analysis, we propose the following hypothesis.

Hypothesis H1 (H1). *Attitude has a significant positive effect on behavioural intentions towards forest therapy tourism.*

Hypothesis H2 (H2). *Subjective norms have a significant positive effect on behavioural intentions towards forest therapy tourism.*

Hypothesis H3 (H3). *Perceived behavioural control has a significant positive effect on behavioural intentions towards forest therapy tourism.*

2.3. Risk Perception

Risk perception originates in psychology and refers to an individual's psychological perception of various objective risks. The existence of objective risks in the external environment is complex and varied, and the forms of risk perception are necessarily complex and varied when filtered through the subjectivity of individuals. Hence there are also diverse perspectives on the study of risk perceptions [71–75]. For example, Kaplan & Jacoby classified consumers' perceived risk into five categories: financial risk, functional risk,

physical risk, psychosocial risk and social risk [76]. Other scholars have further validated the existence of six types of risk dimensions, such as financial risk and functional risk [77].

Tourism risk is defined as the possibility that a traveller will suffer various misfortunes during the journey or at the tourist destination [78]. Tourism services are riskier than physical goods and therefore perceived risk is persuasive in explaining consumer travel behaviour and is an important factor influencing travel decisions. Many scholars have dissected the dimensions of tourism risk perception; for example, Cui, F. et al. argue that tourism risk perception includes subjective and objective factors. Subjective factors refer to physical characteristics and mental processes, while objective factors include physical risk, economic risk, equipment risk, social risk, psychological risk, time risk, and opportunity loss [79]. Roehl et al. identified three different risk groups. They summarised seven dimensions of perceived tourism risk, namely facility risk, financial risk, psychological risk, satisfaction risk, time risk, psychological risk, and social risk [80]. Xu Hui et al., found that the consumer tourism risk perception dimensions included nine dimensions of physical risk, functional risk, financial risk, communication risk, psychological risk, social risk, service risk, facility risk, and communication risk [81].

Most of the above studies understand risk perception in terms of the cognitive risk dimension, while fewer studies understand risk in terms of emotional risk [82,83]. Cognitive risk perception refers to an individual's perception of the susceptibility to a particular risk and the severity of the infection [84]. In contrast, affective risk perception refers to the concern, anxiety or fear that the risk will cause harm to the individual [85]. Some scholars have usefully explored cognitive and affective risk perceptions. For example, Minsun Shim & Myoungsoon You examined the intention to consume food associated with an outbreak in terms of both cognitive risk perception and affective risk perception, both independently and jointly predicted [86]. COVID-19 is a global public health event, with daily announcements of the number of confirmed diagnoses and deaths, leading the public to form an overall risk perception rather than specific risk dimensions. Emotional perceptions of risk, such as worry, anxiety and fear, may often lead to behaviours different from perceived risk perceptions [87]. The impact of emotional risk perceptions may be greater than the impact of cognitive risk perceptions, especially when the risk type is classified as high fear risk [88]. Due to the highly contagious nature of COVID-19 and measures such as isolation following illness, individuals will experience more emotions such as worry, anxiety and fear about the infectious disease, which may lead to behavioural changes in individuals. Therefore, this study will explore the perceived risk of COVID-19 among travellers along two dimensions: cognitive risk perception and affective risk perception.

The level of risk perception directly influences the choice of destination; the higher the perceived risk of a destination, the more likely travellers will avoid it. The higher the level of anxiety and risk among travellers, the more likely they will feel that the environment is unsafe and evacuate [22]. According to previous research on health belief models, risk perceptions can promote increased health protective attitudes and behavioural intentions [89,90]. Therefore, individuals' attitudes and behavioural intentions toward healthy forms of tourism, such as rural tourism and forest therapy tourism, increase in the context of the COVID-19 pandemic [91,92]. In addition, the improvement of forest therapy tourism facilities has contributed to the possibility that tourists may be willing to give more time and resources to participate because of the impact of the epidemic. In summary, the following hypotheses are proposed.

Hypothesis H4a (H4a). *Cognitive risk perception has a significant positive impact on attitudes towards forest therapy tourism.*

Hypothesis H4b (H4b). *Affective risk perception has a significant positive impact on attitudes towards forest therapy tourism.*

Hypothesis H5a (H5a). *Cognitive risk perception has a significant positive effect on subjective norms.*

Hypothesis H5b (H5b). *Affective risk perception has a significant positive effect on subjective norms.*

Hypothesis H6a (H6a). *Cognitive risk perception has a significant positive effect on perceptual behavioural control.*

Hypothesis H6b (H6b). *Affective risk perception has a significant positive effect on perceptual behavioural control.*

Hypothesis H7a (H7a). *Cognitive risk perception has a significant positive effect on behavioural intentions for forest therapy tourism.*

Hypothesis H7b (H7b). *Affective risk perception has a significant positive effect on behavioural intentions for forest therapy tourism.*

2.4. Analysis of Mediating Effects and Cohort Differences

Previous studies have shown that attitudes, subjective norms and perceived behavioural control mediate between variables [93–96]. In China, due to the persistence of COVID-19, people are paying more attention to health tourism, and more and more people are joining forest therapy tourism. The atmosphere may promote more people to participate. The government has introduced various policies and measures to promote the development of forest therapy tourism. Relevant enterprises are actively improving the supply of forest therapy tourism, making more products available to tourists and participation easier. Against this background, we put forward the following hypothesis.

Hypothesis H8 (H8). *Attitude mediates risk perception (cognitive/emotional) and behavioural intentions towards forest therapy tourism.*

Hypothesis H9 (H9). *Subjective norms mediate risk perception (cognitive/emotional) and behavioural intentions towards forest therapy tourism.*

Hypothesis H10 (H10). *Perceived behavioural control is a significant mediator between risk perception (cognitive/emotional) and behavioural intentions for forest recreation.*

Previous studies have shown that demographic characteristics have a significant relationship with consumer risk perceptions, influencing their behavioural intentions [82]. In particular, gender is often used as a meaningful variable influencing the way tourists obtain information as well as their travel preferences, travel spending, and other behaviours [97]. COVID-19 has also been studied by several scholars to examine the behavioural patterns of residents of different genders. For example, the findings of Vincenzo Galasso et al. on Gender differences in COVID-19 attitudes and behavior showed that women are more likely to perceive COVID-19 as a very serious health problem, to agree to restrictive public policy measures, and to comply with them [98]. Therefore, we hypothesised that gender had a moderating role in the constructed relationship.

Hypothesis H11 (H11). *Male and female participants differ in the relationships between risk perception, attitudes, subjective norms, perceived behavioural control and behavioural intentions towards forest therapy tourism.*

2.5. Theoretical Framework

This study adds COVID-19 risk perception into the eTPB to construct a model of the influence mechanism of behavioural intention towards forest therapy tourism (Figure 1).

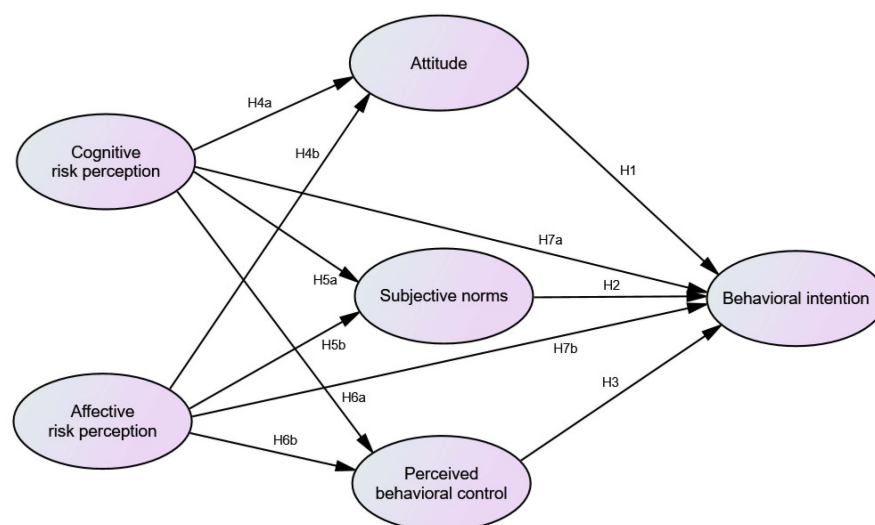


Figure 1. Proposed research framework.

3. Methodology

3.1. Research Instrument and Data Collection

The population of this study is adults aged 20 years and above, mainly because this group has better financial means to undertake tourism. The data are from field research conducted by the subject team in Hubei from October 2021. The main reasons for selecting Hubei Province were, first, because the COVID-19 epidemic first started in Hubei, which suffered a substantial loss of life and economic loss due to the limited knowledge of COVID-19 and local medical conditions at the time. Second, all 17 prefecture-level cities (directly administered counties) in Hubei Province had cases of COVID-19. Third, Hubei Province has one of the better government policies on epidemic prevention and residents' awareness of personal protection in the country, making it more likely to engage in a healthy and ecological approach to tourism. Fourth, Hubei Province is uniquely positioned for forest recreation, which allows residents to choose this form of tourism.

The survey used random sampling and convenience sampling methods. Three cities were randomly selected from 17 cities in Hubei Province. Three researchers in each city randomly distributed 210 questionnaires in city parks and shopping malls. A total of 427 valid questionnaires were obtained after eliminating invalid questionnaires, such as those completed for too short a period and those with the same answers for two consecutive variables, according to the research theme and relevant indicators.

The design of the scale drew on the findings of Bae, S.Y. and Chang, P.J. [59]. During the scale design process, preresearch questionnaires were distributed in September 2021 to ensure quality, accuracy, and applicability. Questions that were ambiguous or not clearly expressed were corrected through analysis of the preresearch questionnaire. The official questionnaire was designed using a 5-point Likert scale, with a scale of 1–5 representing 'strongly disagree' to 'strongly agree'. The questionnaire consists of two parts, one with basic information about the respondent and the other with COVID-19 risk perceptions and items related to attitudes, subjective norms, perceptual behavioural control, and intentions towards forest recreation tourism.

Using covariance-based structural equation modelling (CB-SEM), we aimed to test the effect of COVID-19 risk perception on intention to travel for forest recreation and whether there is a mediating effect of certain variables, and to explore differences between gender groups.

We used IBM SPSS 23.0 and Amos 24.0 software to analyse the data (IBM, New York, NY, USA). To examine the quality and structure of the variables, exploratory factor analysis, confirmatory factor analysis (CFA), and structural equation modelling (SEM) were implemented to examine the causal relationships between the constructs. A bootstrapping

approach was then used to test the mediating role of attitudes, subjective planning and perceived behavioural control. Finally, differences between gender cohorts were examined.

3.2. Data Analysis (CB-SEM)

Structural equation modelling is widely used in a variety of disciplines, particularly in the social sciences [99]. Structural equation modelling allows the researcher to statistically examine “whether a hypothesised model is consistent with the data collected to reflect [the] theory” [100] (p. 34). Structural models include covariance-based SEM (CB-SEM) and variance-based SEM (PLS-SEM) [101]. CB-SEM emphasises total fitness, mainly by testing the applicability of the theory, and is suitable for the testing of theoretical models (validation). PLS-SEM, the PLS component, designed primarily to explain variance (detecting whether causality is significantly related), is suitable for performing theoretical model building (exploratory) and can be used to validate the inferred causal relationships explored. Given that this study is primarily a validation based on an existing model, CB-SEM was used.

4. Results

4.1. The Social-Demographic Characteristics of the Respondents

Table 1 displays the demographic information of the participants. Among the recovered samples, 253 were female, accounting for 59.3%. The sample covered age groups above 20 years old, with 56.2% of respondents aged 31–50 and 29.3% unmarried, representing 125 full-time college students. The majority of the respondents had attained a high school degree or above, with a proportion of 80.6%. Approximately 73.5% of the respondents' monthly average income was above 3000 RMB (approximately 472 USD).

Table 1. Demographic information ($n = 427$).

		<i>n</i>	%
Gender	male	174	40.7
	female	253	59.3
Age	20–30	132	30.9
	31–40	85	19.9
	41–50	155	36.3
	51–60	43	10.1
	60 above	12	2.8
Education	middle school below	83	19.4
	high school and secondary school	134	31.4
	college and undergraduate	175	41.0
	master's degree and above	35	8.2
Marital status	married	302	70.7
	single	125	29.3
Monthly average income (RMB)	3000 and below	113	26.5
	3001–5000	158	37.0
	5001–8000	95	22.2
	8001–10,000	27	6.3
	10,001 and above	34	8.0

Note: RMB = Renminbi, USD1 = 6.354 RMB.

4.2. Reliability and Validity Test

Quality and structural analysis of variables refer mainly to the testing of the reliability and validity of variables to determine whether the sample data are reliable and valid.

4.2.1. Exploratory Factor Analysis

Before conducting exploratory factor analysis, the KMO value and Bartlett's sphericity test should also be calculated for the sample data to determine whether the data are suitable

for factor analysis. The results show that the KMO is 0.859, the approximate chi-square is 5004.167, the degrees of freedom is 231, and the probability of significant value is less than 0.001, indicating that the data are suitable for exploratory factor analysis. Using the principal component analysis method to extract the common factors and the maximum variance method for factor rotation, the results of the exploratory factor analysis for each variable were calculated, as shown in Table 2. The six extracted principal components explained 71.248% of the cumulative total variance of all variables. Based on the content and significance of the question items contained in each component, combined with the analysis of relevant literature above, the six principal components were named as cognitive risk perception, affective risk perception, attitude subjective norms, perceived behavioural control, and behavioural intention.

Table 2. Total Variance Explained and Rotated Component Matrix.

Constructs	Items	1	2	3	4	5	6
Cognitive risk perception	CR1					0.860	
	CR2					0.837	
	CR3					0.643	
Affective risk perception	AR1	0.822					
	AR2	0.870					
	AR3	0.800					
	AR4	0.724					
	AR5	0.734					
Attitude	A1				0.757		
	A2				0.865		
	A3				0.826		
Subjective norms	S1		0.782				
	S2		0.765				
	S3		0.764				
	S4		0.766				
Perceived behavioural control	P1						0.558
	P2						0.839
	P3						0.875
behavioural intention	B1			0.775			
	B2			0.806			
	B3			0.809			
	B4			0.701			
Cumulative Total Variance Explained		15.407	29.053	42.165	53.409	62.826	71.248

4.2.2. Confirmatory Factor Analysis

Before conducting the confirmatory factor analysis, the model fit was first tested to ensure that the model had a good overall fit. The overall fit of the model showed a good fit with $\chi^2 = 488.882$, $df = 196$, $p < 0.001$, $\chi^2/df = 2.494$, RMSEA = 0.059, CFI = 0.940, IFI = 0.940, TLI = 0.929. The results showed that the Cronbach's for each question item lay between 0.666–0.882, which was greater than the acceptable value of 0.6. The combined reliability CR values were all greater than 0.7, and the average extracted variance (AVE) values were largely greater than 0.45, thus providing good reliability (Table 3). The discriminant test for differential validity between the variables followed Fornell and Larcker's recommendation that the square root of the AVE value for each latent variable should be greater than the correlation coefficient between the variables [102]. The square roots of the AVEs were all greater than the correlation coefficients between the variables, and therefore, the discriminant validity between the latent variables was good (Table 4).

Table 3. Results of confirmatory factor analysis.

Constructs	Items	Std. Factor Loading	Cronbach's α	CR	AVE
Cognitive risk perception	Overall, the likelihood of having a COVID-19 infection was high	0.821	0.777	0.794	0.568
	There is a high chance of COVID-19 infection compared to other diseases	0.83			
	There is a high chance of dying from COVID-19	0.585			
Affective risk perception	I was afraid that I would get infected	0.808	0.865	0.871	0.576
	I worry about infecting my family and friends	0.852			
	I fear that COVID-19 will happen in my area	0.765			
	I am concerned that COVID-19 will become a health issue	0.683			
	I fear that COVID-19 hits every year	0.67			
Attitude	Forest health care tourism is an active and healthy way of tourism	0.75	0.877	0.884	0.720
	Forest health tourism can effectively relax	0.903			
	It is pleasant to participate in forest health care and tourism activities	0.884			
Subjective norms	Many people are doing forest health care tourism now	0.776	0.882	0.884	0.656
	The government supports forest health care tourism	0.859			
	The media is promoting forest health care tourism	0.843			
	Important relatives and friends around me also support me in participating in the forest health care tourism	0.758			
Perceived behavioural control	At present, it is difficult to find the right forest health care base for tourism	0.545	0.666	0.712	0.458
	I do not have enough time to carry out forest health care tourism at present	0.653			
	I have no good economic conditions to carry out forest health care tourism at present	0.806			
behavioural intention	I am willing to participate in the forest health care tourism	0.811	0.866	0.870	0.626
	I am willing to spend more money for the services or projects in the forest health care tourism base	0.715			
	I will encourage other relatives and friends to participate in the forest health care tourism	0.863			
	I am willing to actively promote forest health care tourism	0.769			

Note: CFI = 0.940, IFI = 0.940, TLI = 0.929, RMSEA = 0.059.

Table 4. Correlation and discriminant validity analysis of the main variables.

	Cognitive Risk Perception	Affective Risk Perception	Attitude	Subjective Norms	Perceived Behavioural Control	Behavioural Intention
Cognitive risk perception	0.754					
Affective risk perception	0.494	0.759				
Attitude	0.184	0.253	0.849			
Subjective norms	0.287	0.113	0.619	0.810		

Table 4. Cont.

	Cognitive Risk Perception	Affective Risk Perception	Attitude	Subjective Norms	Perceived Behavioural Control	Behavioural Intention
Perceived behavioural control	0.097	0.123	0.170	0.138	0.677	
Behavioural intention	0.166	0.090	0.545	0.735	0.197	0.791

Note: The bold numbers on the diagonal are the square root of the AVE.

4.3. Path Analysis

Next, SEM was used to conduct verification (Figure 2). The model fit indices for the structural model were RMSEA = 0.072, CFI = 0.909, NFI = 0.874, TLI = 0.894, demonstrating a good fit to the data. Cognitive risk perception exhibited a significantly positive influence on subjective norms ($\beta = 0.320$, $p < 0.001$), supporting H5a, but it did not show significant effects on attitude and perceived behavioural control, rejecting H4a and H6a. Affective risk perception exhibited a significantly positive influence on attitude ($\beta = 0.188$, $p < 0.01$), supporting H4b, whereas it did not affect subjective norms and perceived behavioural control, rejecting H5b and H6b. Both cognitive risk perception and affective risk perception had no significant positive influence on behavioural intention, rejecting H7a and H7b. Attitude, subjective norms and perceived behavioural control had positive influences on behavioural intention ($\beta = 0.204$, $p < 0.001$; $\beta = 0.678$, $p < 0.001$; $\beta = 0.103$, $p < 0.05$), supporting H5, H6, and H7 (Figure 2).

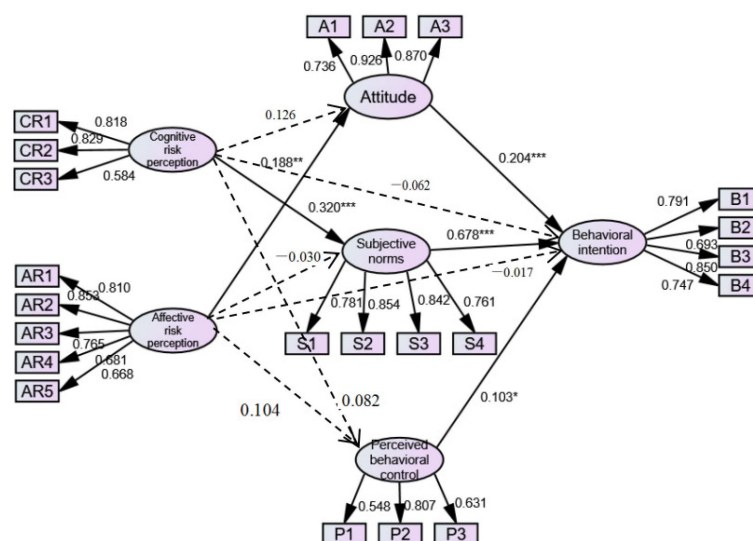


Figure 2. Standard estimates of structural equation model path analysis. CFI = 0.909, NFI = 0.874, TLI = 0.894, RMSEA = 0.072; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.4. Mediation Test

After the model was established, this study used bootstrapping to evaluate the mediating role of attitude and subjective norms, setting a replicate sample of 5000 and using maximum likelihood estimation with fixed confidence intervals (PC) and bias-corrected confidence intervals (BC) of 95%. Table 5 indicates that among the associations in affective risk perception, cognitive risk perception, attitude, subjective norms, and intention, no zero existed between the lower and upper bounds of the indirect effect. Additionally, estimates of the indirect effect were not zero. Therefore, attitude exhibited a mediating effect on the relationship between affective risk perception and behavioural intention, partially supporting H8. In addition, subjective norms also acted as a significant mediator between cognitive risk perception and behavioural intention, partially supporting H9. But

perceived behavioural control was not a significant mediator between risk perception and behavioural intention, rejecting H10.

Table 5. Bootstrapping effects and 95% confidence intervals (CI).

Pathways	Estimates	SE	Bis-Corrected 95%CI		
			Lower	Upper	<i>p</i>
Affective risk perception→Attitude→behavioural intention	0.058	0.025	0.019	0.123	0.008
Cognitive risk perception→subjective norms→behavioural intention	0.150	0.035	0.092	0.23	0.000

4.5. Multi-Group Analysis

To examine the potential moderating effect of gender, multi-group analyses were conducted to compare differences in the coefficients of the corresponding structural paths for males and females using the CR (Critical ratios for differences between parameters) value. When the CR value > 1.96, there is a significant difference between the two groups [62].

The comparison of results by gender, reported in Table 6, indicates that the path coefficients from perceived behavioural control to behavioural intention were significantly different between males and females. The impact of perceived behavioural control on behavioural intention among female participants was much stronger than among males. Thus, H11 was partially confirmed.

Table 6. Critical Ratios for Differences between Parameters (Measurement weights).

			Male	Female	CR Value
			Estimate	Estimate	
subjective norms	<—	Cognitive risk perception	0.398	0.206	−1.776
Attitude	<—	Affective risk perception	0.254	0.263	−0.661
behavioural intention	<—	Attitude	0.153	0.197	0.508
behavioural intention	<—	subjective norms	0.779	0.591	−1.547
behavioural intention	<—	Perceived behavioural control	−0.069	0.178	2.37

5. Discussion

Based on the theory of planned behaviour, this study examines the influence of risk perception on behavioural intentions towards forest therapy tourism during the COVID-19 pandemic.

First, the results showed that attitudes towards forest therapy tourism were positively but nonsignificantly associated with perceptions of cognitive risk, while they were significantly and positively associated with perceptions of emotional risk. That is, positive attitudes towards forest therapy tourism were not based on the threat of disease but on personal concerns about contracting COVID-19 for themselves and their families. This result is consistent with Vindegaard N & Benros M E [103], who found that the epidemic increased the population's suspected psychological disorders and had important emotional effects, producing anxiety, depression, or more severe mental disorders, among other outcomes. These psychological disorders may not stem from actual infection or death but from the individual's fear of possible social stigma, discrimination, etc. During the epidemic, Chinese people became anxious, probably not because of the harm caused by the disease itself but from the psychological changes brought about by disclosing personal information and comments from society. Thus, the COVID-19 pandemic caused individuals who had not considered forest therapy tourism to change their attitudes, possibly due to emotional concerns in this context.

Second, perceived risk perceptions positively influence the subjective norms of forest therapy tourism. When a particular disease poses a threat to the physical health of residents, people may perceive that forest therapy tourism will be supported by their group members.

This attitude is consistent with the findings of Zhao Jing [35], which confirmed the influence of the perceived risk of infectious diseases on residents' willingness to engage in forest therapy tourism. In China, the government, businesses and society are actively promoting forest recreation tourism due to the epidemic, and they may believe that participation in outdoor forest therapy tourism helps to ensure social safety distances and healthy physical and mental development, which is in fact the case [104]. Thus, the perceived risk of COVID-19 has led to more support for forest therapy tourism from respondents.

Third, there was no significant effect of COVID-19 risk perception on behavioural intentions towards forest therapy tourism. This finding is not entirely consistent with the findings of Zhao Jing [35]. The results showed that COVID-19 cognitive risk and emotional risk perceptions had a negative but nonsignificant effect on a willingness to engage in forest therapy tourism. This finding indicates that forest therapy tourism behaviour is somewhat inhibited by the COVID-19 epidemic, but not significantly. The reason for this result may be that the irregular outbreaks of the epidemic in scattered locations in China have increased the risk perception of the population, and coupled with the government's tourism control measures, the willingness of the population to travel has been dampened. However, the Chinese government's rapid and robust "dynamic zero infection" policy has given residents some confidence to travel, so the effect is insignificant.

Fourth, there is a significant mediating role of attitude between perceived emotional risk and behavioural intentions, which is consistent with the findings of Zhao Li, Wangbing Liang et al. [105]. Individuals with perceived emotional risk during the ongoing COVID-19 epidemic have increased positive attitudes towards forest therapy tourism, leading to more behavioural intentions. Currently, COVID-19 outbreaks are scattered irregularly in China, and the ongoing epidemic has put considerable pressure on the state, companies, and individuals. Although the demand for tourism has been dampened by government policies, people have been looking for ways to travel that are stress relieving and relatively safe, hence the popularity of forest therapy tourism as a form of health tourism and the ability to maintain some social distance.

Fifth, subjective norms have a significant mediating role between risk perception and behavioural intentions. During the COVID-19 pandemic in China, the government took strong preventive measures, such as "dynamic zero infection", wearing masks, keeping social distance, and limiting the flow of people in scenic spots, which provided protections that allowed people to travel outside. At the same time, therapy tourism was used as a health-promoting approach to travel. The perceived risk of COVID-19, therefore, leads people to believe that their group members approve of forest therapy tourism, which encourages people to take part in it.

Finally, attitudes, subjective norms, and perceived behavioural control exerted a positive influence on behavioural intentions. This result is consistent with the findings of a large body of previous research on the theory of planned behaviour [106]. Individuals' behavioural intentions towards forest therapy tourism were influenced by behavioural attitudes, group members' approval, and their perceived ability to participate in forest therapy tourism. Gender had a significant moderating effect on the relationship between perceived behavioural control and behavioural intentions. Perceptual behavioural control and behavioural intentions were positively correlated for females, indicating that greater perceptual behavioural control was associated with greater behavioural intentions to engage in forest therapy tourism, while the correlation was negative in the male group. This finding may be related to the fact that women generally show a higher level of knowledge and better protective behaviour than men in terms of hand hygiene and personal protection [107].

6. Conclusions

The study of the relationship between COVID-19 risk perception and behavioural intentions for forest therapy tourism is of theoretical and practical importance. It may help to understand whether and how COVID-19 risk perception influences behavioural intentions for forest therapy tourism.

6.1. Theoretical Contributions

Our research makes two main theoretical contributions to the literature on risk perception and forest therapy tourism. First, based on the Health Belief Model and the extended Theory of Planned Behaviour, the study constructs a conceptual model of risk perception on behavioural intentions towards forest therapy tourism to better understand whether and how COVID-19 risk perception influences potential tourists' forest therapy tourism behaviour. Cognitive and affective risk perception were incorporated into a theoretical model of planned behaviour. The empirical results verified that cognitive and affective risk perception influence forest therapy tourism behavioural intentions through subjective norms and attitudes. The extensions, modifications and inclusion of new variables to the TPB model are consistent with previous research [59].

Second, previous tourism risk perceptions have focused on cognitive risk perceptions, such as physical risk, financial risk, social risk, and psychological risk, with less attention paid to emotional risk perceptions [86]. In this study, emotional perceptions were incorporated into the model to better match peoples' emotions such as anxiety, depression, and fear during the COVID-19 pandemic [108,109], and such emotional perceptions were empirically verified to have a significant positive effect on attitudes, which further influenced behavioural intentions towards forest therapy tourism. It suggests that the perception of emotional risk, such as anxiety and fear brought about by the COVID-19 pandemic, also has a very important influence on behavioural intentions.

6.2. Practical Contributions

Understanding how COVID-19 risk perceptions act on the behavioural intentions of forest therapy tourism provides a basis for understanding tourists' attitudes and behaviours towards risk perceptions and formulating and improving tourism risk management and forest therapy development strategies.

First, as COVID-19 cognitive and affective risks positively influence behavioural intentions in forest therapy tourism through attitudes and subjective norms, there is a need to strengthen risk management in forest therapy tourism destinations, improve epidemic prevention and control initiatives, positively project an image of destination safety to tourists, and reduce their perception of COVID-19 risk perception. Destinations should establish a sound risk management system, especially systems related to epidemic prevention and control during the epidemic. They should identify a leading group for epidemic prevention and control; carry out epidemic risk management in terms of the internal environment, target setting, risk identification and assessment, risk factors, areas likely to be affected, duration, information and communication, emergency management, and preventive measures, and realise comprehensive risk management in terms of the whole process, factors, staff, and measures. These measures will improve the safety perception of potential tourists and provide security for the sustainable development of tourism during the epidemic.

Second, as positive forest therapy tourism attitudes and subjective norms have an obvious role in promoting behavioural intentions, the government and enterprises should take relevant measures to actively raise the health awareness of the entire population and advocate a healthy and sustainable way of tourism. Residents should be actively motivated to protect forest therapy tourism resources and promote the development of forest therapy tourism to improve their quality of life [110].

Third, destinations can use news websites, social media, short videos, and other channels to promote the product features, therapy activities, and facilities to tourists, and actively promote the destination's anti-epidemic initiatives and safety image, vigorously publicise the benefits of forest recreation tourism for human health, and guide residents to reduce the perceived emotional risk of COVID-19 by de-escalating the adverse emotions such as anxiety, fear, and depression brought about by COVID-19 through forest therapy tourism.

Fourth, the empirical results show that perceived behavioural control has a positive impact on behavioural intentions towards forest therapy tourism. Therefore, social stakeholders should create conditions to reduce the difficulties and obstacles for tourists to

participate in forest therapy tourism by adopting measures such as improving the supply of forest therapy tourism products and implementing a paid leave system. Specifically, the government should scientifically formulate plans for the forest therapy industry, increase policy support, vigorously cultivate leading forest therapy enterprises, and implement a paid leave system to guarantee the leisure time available to tourists. Encourage the development of the forest therapy industry in poor areas. Strengthen land use protection and meet the demand for land for the forest therapy industry according to law and regulations. Broaden investment and financing channels, and encourage various forestry, health, pension, Chinese medicine and other industrial funds and social capital to enter the forest therapy industry in various forms in accordance with the law. Improve the mechanism of joint construction and sharing, and encourage localities to promote the integrated development of forest therapy and health care, elderly care services and Chinese medicine industries, to achieve mutual promotion and a win-win situation. Forest therapy enterprises should improve the accessibility of forest therapy for tourists and reduce obstacles by improving infrastructure and service facilities and developing forest therapy products that meet market demand.

6.3. Shortcomings and Outlook

Despite the contributions of this study, there are certain shortcomings. First, with the cross-sectional data used in this study, whether the behavioural intentions of potential tourists towards forest recreation tourism have changed after the epidemic needs to be further explored. Second, due to time and financial constraints and the need for epidemic prevention and control, this study was conducted in Hubei Province, where the epidemic began. The sample was not nationally representative, so whether the behavioural intentions in other provinces are the same as those in Hubei needs to be further investigated and verified. Third, as risk perceptions are easily influenced by various factors, such as the surrounding environment, individuals, and policies, the results of the analysis of the questionnaire data alone need to be further verified, and qualitative research methods can be introduced into the study in the future to verify and enrich the findings of this study. Forth, With nearly 60% of respondents being female, our findings should be interpreted with caution as this may not reflect the overall true picture, which may be related to our choice of research location. Future research may have to control the gender ratio of respondents to ensure that it is largely balanced and representative of the overall profile. At the same time, differences in risk perception decisions can be studied for different groups of tourists with different attributes to develop more refined risk management strategies.

Author Contributions: Y.G.: conceptualisation, methodology, article structure design, software, data analysis, writing—original draft; L.C.: supervision, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by (1) Science and Technology Research Project of Hubei Provincial Education Department (Q20202902); (2) Philosophy and Social Science Research Project of Hubei Provincial Education Department (21D105).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data connected to this research are available from the corresponding author under request.

Conflicts of Interest: The authors declare no conflict of interest.

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