



OPEN Perceived quality symbols in short-video social media drive ski tourism behavior

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The rise of short-video social media platforms has transformed consumer decision-making in tourism, particularly in high-risk activities such as ski tourism. This study, grounded in semiotic theory, explored the influence of perceived quality symbols on short-video content on tourists' behavioral motivation, risk perception, and intention to participate in ski tourism. Using a mixed-methods approach, qualitative analysis identified key symbolic dimensions—environmental quality, informational quality, interactive quality, vlogger quality, and service quality—while quantitative analysis validated the “perceived quality symbol–motivation–behavior” model. Findings reveal that perceived quality symbols significantly enhance behavioral motivation and intention, though they do not directly affect risk perception. However, risk perception serves as a negative moderator in the relationship between quality symbols and motivation, indicating a nuanced interplay between symbolic representations and perceived risks. These findings contribute to the theoretical discourse on symbolic interactionism in digital tourism and provide practical insights for destination marketing strategies. By elucidating the impact of visual narratives on consumer perceptions, this study highlights the pivotal role of short-video content in shaping tourism behavior in high-risk settings.

Keywords Short-video social media, Ski tourism, Semiotic theory, Perceived quality symbols, Behavioral motivation, Risk perception

Against the backdrop of rapid advancements in digital technology and the widespread adoption of mobile internet, short-video social media platforms have emerged as primary channels for information acquisition, everyday sharing, and consumer decision-making. Among these platforms, *Douyin* (known internationally as *TikTok*)—a leading example of short-video social media—has assumed an increasingly pivotal role in disseminating travel information¹. Powered by the significant influence of short-video platforms, this trend has not only fueled the emergence of numerous internet-famous attractions but also strengthened destination branding and stimulated regional tourism economies. User-generated content on these platforms has fundamentally reshaped travel decision-making processes and brand perception² bringing the mechanisms through which social media influence tourist behavior into sharp focus³. The successful hosting of the 2022 Beijing Winter Olympics has further amplified interest in ski tourism. However, given the high barriers to entry, substantial costs, and inherent risks associated with skiing⁴ consumer decision-making in this domain is typically cautious and rational, often shaped by interactions on social media⁵. In this context, exploring how short-video social media influences tourist participation in ski tourism holds significant theoretical and practical relevance.

Cassirer's theory of the “symbolic universe” posits that humans construct their understanding of the world through symbolic systems. This perspective offers a novel lens for tourism research, suggesting that tourist destinations⁶ visitor experiences, and consumer behaviors can all be viewed as products of symbolic interaction^{7,8}. On short-video social platforms, the multimedia content uploaded by individuals extends beyond mere documentary-style depictions of daily life, evolving into visual presentations that carry symbolic implications and display functions, thus serving diverse narrative purposes⁹. In the context of ski tourism, sports-related short videos on social networks exhibit rich symbolic metaphors. When examining sports tourism from a socio-cultural standpoint, it is inescapably intertwined with semiotics. According to Peirce's semiotic triangle, the construction of a sign involves three core elements: the “representamen”, the “object”, and the “interpretant”¹⁰. In this framework, the majestic snowscapes of ski resorts, the skilled movements of skiers, and the visual symbols of skiing equipment are encoded as “representamen” on short-video platforms. Tourists decode these signs to form their cognitive understanding of the “object” (ski tourism) and the “interpretant” (meaning) associated with it.

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MacCannell's theory of "Staged Authenticity" posits that the essence of the tourism experience lies in tourists' pursuit of symbolized "authenticity"^{10,11}. On short-video social media platforms, ski tourism videos function as temporal sequences of dynamic symbols representing ski destinations. Tourists' decision-making behaviors may be influenced by their interpretation of these visual-symbolic cues. However, the actual experience of tourists may diverge from this constructed "authenticity" due to the staged nature of these symbols. For instance, the blending of natural snow landscapes (authentic symbols) with artificially snowed areas (staged symbols) could affect tourists' perception of "pristine" quality¹². Within the visual narrative framework of short-video social media, ski tourism videos leverage dynamic imagery and symbolic systems to shape tourists' consumption perceptions in multiple dimensions. While existing research on ski tourism has predominantly examined factors such as climate conditions^{13–16} regional economic development^{17–19} tourism marketing^{20–22} tourist psychology and behavior^{23–25} the semiotic mechanisms through which short-video social media influences ski tourism behavior remain largely unexplored. Although social media has become a key driver of tourism consumption^{5,26} its symbolic impact on ski tourism remains insufficiently studied. The scarcity of relevant literature highlights a critical research gap, necessitating an in-depth investigation into how symbolic representations in short videos shape tourists' perceptions, motivations, and decisions.

Against this backdrop, this study aims to address the following three questions: (1) What is the semiotic significance of perceived quality in ski tourism as conveyed through short-video social media, and how is this meaning manifested? (2) How can tourists' psychological characteristics be understood from a semiotic perspective, and what psychological or behavioral impacts do ski tourism short videos have on their engagement? (3) How do ski tourism short videos impact the psychological and behavioral responses of ski tourists?

Study 1 - Construction of theoretical model

Methodology

Research design

Study 1 adheres to the qualitative research paradigm and employs a combination of face-to-face, online, and telephone interviews to collect primary data. To ensure comprehensive coverage of key topics while allowing flexibility for follow-up and elaboration, semi-structured interviews were employed to collect first-hand research data. From the viewpoint of ski tourists, a purposive and snowball sampling approach was used to select 10–20 participants who had prior experience with ski tourism and had actively searched for ski-related short videos within the past year. Based on the inductive analysis of the interview data, categories and core categories influencing tourists' decision-making behaviors were extracted through a three-step coding process: open coding, axial coding, and selective coding. This process revealed the impact of the perceived quality symbols in ski tourism short videos on tourists' consumption psychology and decision-making, ultimately leading to the development of a theoretical model of ski tourism.

To avoid homogeneity, focus on the core demographic, and minimize confounding variables, this study selected interview participants aged 25 to 40 with diverse backgrounds. This group comprised Ph.D. students in sports and tourism-related fields, tourism company managers, ski resort administrators, and ski tourism enthusiasts. The aim was to collect data on factors influencing consumer decision-making in ski tourism as portrayed on short-video social media platforms. The demographic profiles of the interviewees are presented in Appendix A.

Drawing on relevant literature, the interview guide was structured around attribution-related questions to ensure systematic, consistent, and comprehensive interviews. The guide consisted of two main sections: an introductory segment and the main body (detailed in Appendix B). The introduction aimed to help participants relax and recall their recent experiences and perceptions of ski tourism short videos, with the option to search for relevant videos during the interview. The guide contained 10 key questions, such as: "What specific elements or symbols (e.g., snow landscapes, equipment displays, interactive comments) in the ski tourism videos you watched made you feel an impulse to 'experience it yourself'?"

Interviews with 16 participants were conducted, at which point data saturation was reached, and no additional insights were obtained²⁷. To ensure the accuracy and completeness of the interview content, audio recordings were made with the participants' consent, facilitating later transcription into textual material. Each interview lasted approximately 30 min.

Ethics Review Committee of Luoyang Normal University approved the study1 and study2. We strictly adhered to the Declaration of Helsinki, conducting all research in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants before data collection. Participants were informed of the study's purpose, assured of anonymity, and told that results would be used solely for academic research. Only those who voluntarily agreed were included in the study.

Coding process

After each interview, the interview transcripts and recordings were promptly organized within 24 h to minimize any potential biases from delayed transcription. The data were systematically analyzed and continuously refined to improve the interview structure, ultimately converting the content into textual material for qualitative analysis using Nvivo 11.0. Two coders independently performed the data coding, followed by a comparison, discussion, and adjustment of the coding results. The detailed steps in the coding process are as follows:

Open Coding: Initial coding was independently conducted by two doctoral candidates specializing in tourism. Unstructured content from the preliminary interviews was first labeled with conceptual tags, resulting in 51 initial concepts. Through three iterative rounds of discussion, these labels were consolidated and categorized into 15 subcategories. Any discrepancies were resolved through arbitration by two senior professors. To ensure coding validity, five interviewees were randomly selected to verify whether the coding accurately reflected their intended meanings.

Axial Coding: This phase considered the relationships between categories, integrating the current socio-cultural context²⁸. Based on their inherent characteristics and interconnections, four primary categories were identified. A coding example is provided in Table 1.

Selective Coding: The four primary categories derived from axial coding were visualized and theorized, with an emphasis on the interrelationships between categories and their connection to the existing literature. This process led to the development of a “storyline”²⁹ that integrates all categories. Based on this storyline, the study constructs a novel integrated model—Perceived Quality Symbol → Motivation → Behavior—which explains the influence of perceived quality symbols in ski tourism short videos on consumer behavioral intentions.

Results and hypotheses

The significance of perceived quality symbols

With the advancement of information technology, ski tourism increasingly relies on short-video marketing to attract and engage consumers. The recurring clusters of symbols in these videos—such as environmental quality, information quality, interaction quality, vlogger quality, and service quality symbols—establish a benchmark for perceived quality in ski tourism.

Unlike traditional static tourism marketing, ski tourism leverages short-video social media platforms to construct a highly immersive “visual narrative field” through a variety of symbolic cues, including environmental quality, informational accuracy, interactivity, vlogger credibility, and perceived service quality. Specifically, Environmental Quality Symbols (EQ) refer to the visual representation of both natural and artificial features of ski resorts within short videos. Information Quality Symbols (IfQ) encompass the accuracy, authenticity, and consistency of product- and service-related information conveyed through these videos. Interaction Quality Symbols (ItQ) capture user–content creator engagement in the absence of face-to-face communication, manifesting through likes, comments, and other symbolic interactions such as text and image-based feedback. Vlogger Quality Symbols (VQ) denote cues related to the vlogger’s expertise, professionalism, and communicative demeanor, all of which enhance perceived credibility. Service Quality Symbols (SQ) reflect the portrayal of personalized services, immersive experiences, and the fulfillment of user needs as communicated through video content. These findings extend the application of classical semiotic theory into dynamic media environments, reinforcing prior research that has identified interactivity^{30–32} service quality³¹ high-quality content³² and opinion leader³² as key drivers in short-video tourism marketing.

As respondents noted, “Ski resorts are often located in mountainous regions, and through short videos, I can see the scenery. It seems incredibly beautiful, almost awe-inspiring, as if it’s a masterpiece of nature”(M02). “The comment section contains a lot of useful information, including reviews from people who have been there”(F16). “Some ski resorts collaborate with popular influencers who film the skiing experience from a first-person perspective, which many viewers find appealing” (F12).

The Relationships of Perceived Quality Symbols on Behavioral Motivation, Behavioral Intentions, and Risk Perception.

Short-video platforms can significantly influence user decision-making through both the intrinsic characteristics of the videos and individual perceptions^{33,34}. Behavioral motivation in ski tourism refers to the internal drive that initiates or sustains users’ participation in ski-related activities through short-video social media platforms. Behavioral intention denotes the likelihood that users will engage in ski tourism either directly (by visiting) or indirectly (through recommendations or invitations). Prior studies suggest that the formation

Original Statement	Initial Concept	Sub-category	Main Category
If there are a lot of people, I might not really want to go experience it.	Customer flow	Environmental quality symbol	Perceived quality symbol
It's not really what the ski resort is actually like, it can be exaggerated.	Information authenticity	Information quality symbol	
You can interact with the vlogger through text, pictures, likes, etc.	Ways of interaction	Interaction quality symbol	
The vlogger wears professional gear, skiing while explaining.	Professional competence	Vlogger quality symbol	
From the routes to food, accommodations, and activities, it's all an immersive first-person experience.	Immersive experience	Service quality symbol	
For activities like skiing, I think it's more fun when there are more people.....and afterwards, you can all have dinner together and hang out.	Friend gathering	Family socializing	Behavioral motivation
I really enjoy that adrenaline rush, like riding a roller coaster, the feeling of going all the way down.	Experience the excitement	Curiosity and thrill	
It's a great way to work out and get that satisfaction from the physical effort.	Enjoy the pleasure	Leisure and entertainment	
Skiing's a good sport for fitness, and it burns a lot of calories.	Promote exercise	Physical health	
I rarely see ads. When we go, it's usually older friends taking us.	Word of mouth	Willingness to invite and recommend	Behavioral intention
Like with ski trip lengths, if the price is the same, I'd rather buy online because it's more convenient.	Online consumption	Willingness to participate in consumption	
Sometimes, the snow is really wet.....the humidity was so high that we couldn't even ski properly.	Snow quality impact	Environmental risk perception	Risk perception
Ski resorts abroad have designated beginner slopes, so no one is suddenly skiing past you, which feels safer.	Lack of designated slopes	Facility risk perception	
Places like the kids' parks at ski resorts are really cheap, but they also come with some safety concerns.	Safety management	Management risk perception	
Falling definitely hurts, and it's not just when you fall yourself, others might crash into you.	Falling and crashing	Sports risk perception	

Table 1. Open coding and axial coding.

of tourism behavior among short-video users typically unfolds in two stages: the generation and internalization of motivation, followed by the transformation of tourism motivation into intention and behavior³⁵. Ski tourism motivation emphasizes tourists' psychological immersion and emotional experiences³⁶. As viewers engage with short videos showcasing well-maintained ski resort facilities, picturesque environments, lively atmospheres, and thrilling action shots, the stronger the emotional responses—such as pleasure and excitement—the more likely they are to be motivated to seek out similar experiences. Short-video platforms, through high-quality environmental presentations, valuable information dissemination, smooth interaction, professional hosts, and thoughtful service, present a novel and creative perspective on the natural and cultural attractions of ski destinations. This not only sparks interest in skiing but also strengthens motivation, ultimately influencing the decision-making process and enhancing decision satisfaction.

As respondents noted, *"Watching ski videos excites me. Seeing others ski impressively makes me eager to practice myself"* (M04). *"When I see the smiles of people skiing, their joy and excitement—families, couples, all having fun—this attracts me and makes me want to join in"* (M01).

Based on these findings, we propose the following hypotheses:

H1 Perceived quality symbols have a positive effect on behavioral motivation.

H2 Perceived quality symbols have a positive effect on behavioral intentions.

Risk Perception refers to tourists' subjective feelings of potential negative consequences or impacts that may arise during their travel experience³⁷. According to Rogers' research, external sources of information can exert varying degrees of influence on individuals' psychological factors, with risk-related information being a crucial element that triggers individuals' perceptions and cognition of risk³⁸. External risk information can evoke psychological fear, thereby intensifying the perception of risk³⁹. This indicates that, in the process of interaction between the individual and the external environment, risk information plays a pivotal role in shaping risk perception³⁷.

As a result of risk perception, tourists often seek out various forms of information—such as short videos, live streams, and online searches—to gain a clearer understanding of the risks associated with skiing destinations, facilities, and management, thereby enabling them to make informed decisions⁴⁰. On short-video platforms, the authenticity of symbols and risk narrative strategies together create a bidirectional moderating mechanism for risk perception. When symbols are presented with high authenticity, tourists tend to assess risks more rationally; conversely, excessive idealization of symbols can lead to a "symbolic bubble," amplifying perceived risk due to discrepancies between expectations and actual experiences.

In the context of ski tourism, short-video marketing often highlights risks related to the environment, facilities, management, and sports activities. However, high-quality short videos can proactively inform tourists about these risks, enhancing their viewing experience while mitigating risk perception.

As respondents noted, *"On short-video platforms, I can see detailed information about ski resorts, such as the number of slopes, their length, pricing, etc., which allows me to compare and choose what suits me best"* (M05). *"In the videos, I can see that there are safety personnel present, at least guiding and assisting. Since I'm bringing my family, I prioritize safety. Seeing relevant safety signs and measures makes me feel more at ease"* (M06).

Hence, we propose the following hypotheses:

H3 Perceived quality symbols have a negative effect on risk perception.

The Relationships of Behavioral Motivation on Behavioral Intention.

Motivation is the psychological tendency or internal drive that initiates, sustains, and directs an organism's actions toward a specific goal⁴¹. It is widely regarded as a fundamental determinant of behavior. In the context of ski tourism, behavioral motivation reflects tourists' psychological states and is often used as an independent variable to assess the quality of their experience and level of participation, playing a critical role in the tourism service process⁴². The factors driving individuals to participate in sports tourism are diverse and extend beyond mere consumption and social interaction; they also encompass physiological, psychological, and environmental dimensions⁴³.

According to Self-Determination Theory (SDT), motivation can be categorized into intrinsic and extrinsic motivation, each exerting distinct influences on human psychology and behavior⁴⁴. SDT provides a theoretical foundation for understanding the underlying drivers of participation in sports tourism while supplementing existing research⁴⁵. In the realm of sports consumption, factors such as a sense of achievement, knowledge acquisition, and experiential stimulation are classified as intrinsic motivations^{46,47} whereas relaxation and escapism, social interaction, social identity, and differentiation are considered extrinsic motivations⁴⁸. Both types of motivation influence behavioral intention and behavioral persistence in different ways⁴⁹. Specifically, ski tourism motivation has been found to significantly impact tourists' behavioral intentions^{50,51}.

This study categorizes behavioral motivation into four dimensions: family and social interaction, novelty-seeking and excitement, leisure and entertainment, and health and fitness. Social motivation in ski tourism encourages participants to engage with others through shared experiences, thereby increasing their likelihood of recommending and inviting others to participate. Beyond fulfilling personal social needs, this motivation also contributes to the broader expansion of winter sports tourism, fostering a sustained consumption trend. Meanwhile, novelty-seeking and leisure motivations cater to different consumer needs—whether pursuing excitement and unique experiences or simply seeking relaxation and escape from daily routines, ski tourism offers diverse opportunities that enhance consumers' willingness to book trips online. Furthermore, health and fitness motivation positions ski tourism as a means of promoting physical well-being and achieving fitness goals, reinforcing its role as a lifestyle activity and sustaining consumers' long-term behavioral intentions.

Several respondents highlighted these motivations: “Young people naturally enjoy pursuing excitement and novelty. Skiing provides an adrenaline rush, which is a primary reason many young people choose to ski” (M01). “The overall skiing atmosphere is fantastic. In winter, people often talk about going skiing together, and the number of enthusiasts is growing” (F07). “Skiing is a great sport that requires significant physical exertion. Even in winter, just an hour of skiing can leave you drenched in sweat inside a down jacket. It really boosts physical fitness, especially when activity levels tend to be lower in colder months” (F08).

Based on these findings, we propose the following hypotheses:

H4 Behavioral motivation has a positive effect on behavioral intention.

The Relationships of Risk Perception on Behavioral Motivation and Behavioral Intention.

As a high-risk form of sports tourism, skiing presents various potential hazards, including risks associated with terrain and facilities, injuries due to inadequate skills or personal limitations, and safety issues arising from poor management⁴. The unique environmental conditions and technical requirements of skiing impose greater physical demands on participants, thereby heightening tourists’ concerns about potential risks. Before deciding to engage in ski tourism, consumers evaluate the trade-off between risk and reward⁵². Heightened risk perception may lead to hesitation in participation, as perceived risks can diminish experiential value, evoke negative emotions, and increase uncertainty about service reliability, ultimately suppressing purchase intentions^{53,54}.

In an online environment, the way risk is communicated plays a crucial role in shaping consumer behavior⁵⁵. When tourists perceive that ski tourism may not fulfill their expectations for leisure and health benefits, or that it entails unpredictable consequences, they may associate it with financial and time losses, psychological discomfort, and safety concerns⁵⁶. These perceptions, in turn, negatively impact their willingness to participate^{57,58}.

Several respondents expressed concerns regarding skiing-related risks: “I do think skiing is risky. Falling can be quite painful, and beyond self-inflicted injuries, there’s also the possibility of being hit by others. The risk is quite significant, so beginners might give up after just one attempt” (F10). “Skiing becomes much less enjoyable when the slopes are overcrowded” (M11). Additionally, some respondents highlighted how social media influences risk perception: “Recently, I’ve seen short videos showing ski resorts packed with tourists, leading to safety hazards. That kind of content makes me reconsider my plans—I might delay my trip or even choose a different resort” (F09).

Based on these findings, we propose the following hypotheses:

H5 Risk Perception has a negative effect on behavioral motivation.

H6 Risk Perception has a negative effect on behavioral intentions.

Development of the theoretical model

Study 1 identifies key factors influencing consumer participation in ski tourism, including perceived quality symbols, behavioral motivation, risk perception, and behavioral intention. Based on the theoretical analysis and proposed hypotheses, this study further explores the intrinsic relationships driving consumer engagement with ski tourism on short-video social media platforms. Consequently, a theoretical model outlining the determinants of ski tourism behavior in the context of short-video social media is proposed (Fig. 1).

Discussion

Traditional semiotic theories primarily focus on the symbolic meaning of static signs. However, Study 1 reveals how the dynamic visual-symbolic system in short videos actively shapes tourism behavior. According to symbolic interaction theory, individuals construct social behavior through the interpretation of symbols and meanings⁵⁹. Study 1 demonstrates that the symbolic representation of ski tourism—through five dimensions: environmental quality, informational quality, interactive quality, Vlogger quality, and service quality—creates a “visual narrative field.” By decoding these symbols in short videos, tourists develop cognitive and emotional responses that influence their consumption decisions. This mechanism underscores the dynamic interactivity and emotional resonance of symbols, offering a novel analytical framework for the application of semiotic theory in the digital media era^{12,60,61}.

Short-video social media platforms provide ski tourists with vivid and comprehensive travel information. However, the perceived quality symbols conveyed through these videos may have a dual impact on travel decision-making rather than a simple linear enhancement or reduction. Given the inherently high-risk nature of skiing, risk perception emerges as a critical factor influencing tourists’ decision-making. Study 1 confirmed the dynamic characteristics of quality symbols in short-video social media and their capacity to evoke emotional responses in tourists, including behavioral motivation and risk perception. These findings addressed Research Questions 1 and 2 and laid the foundation for answering Research Question 3. By integrating the results from Study 1 with existing literature, a theoretical model and corresponding hypotheses were developed. Study 2 then employed quantitative methods to empirically examine the mechanisms through which perceived quality symbols influence tourists’ ski tourism decision-making, thereby addressing Research Question 3 in depth.

Study 2 - Validation of hypotheses and theoretical model

Methodology

Experimental materials and questionnaire design

Douyin (TikTok) is one of the most influential short-video platforms globally, distinguished by its large user base and strong commercialization⁶². Douyin offers a diverse array of tourism-related short videos, encompassing both product-driven content—such as ticket presales, hotel and dining reservations, travel guides, and user

Determinants of ski tourism behavioral in short-video social media

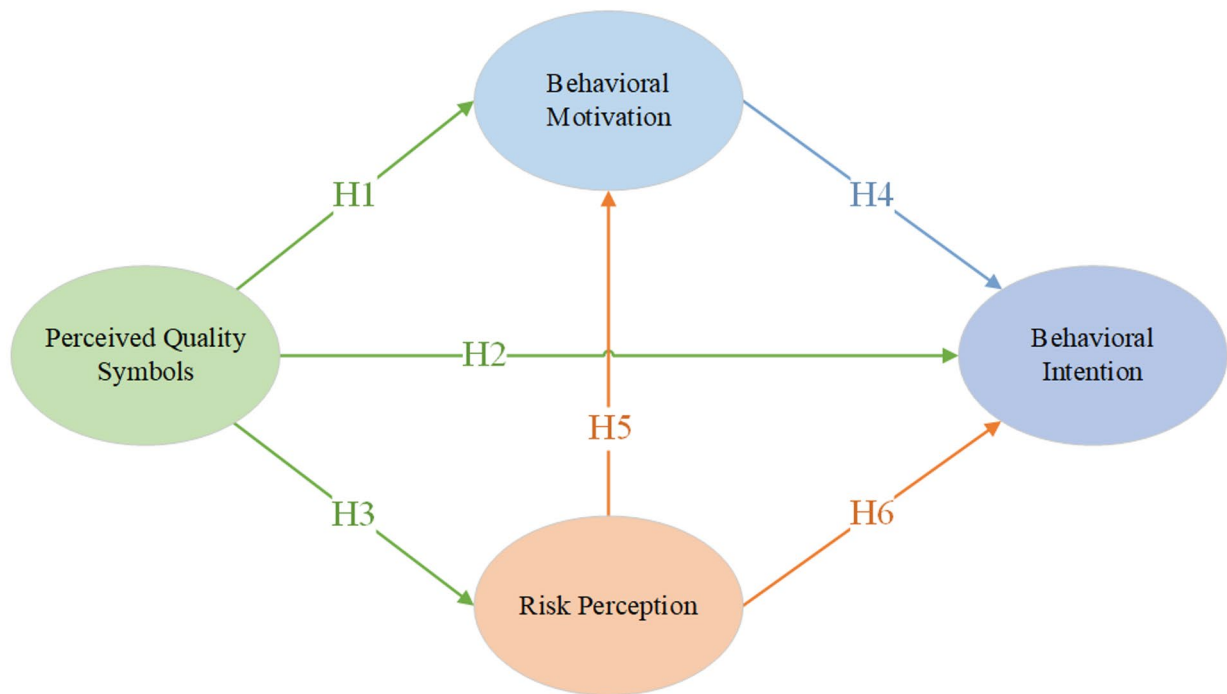


Fig. 1. Conceptual framework and Hypotheses of influencing factors on skiing tourism behavior.

reviews—and a substantial volume of content marketing-oriented videos. Therefore, this study selects Douyin as the source of experimental materials. To ensure the representativeness and influence of the selected videos, ski tourism clips with high engagement metrics, large view counts, and broad reach were identified and used as experimental stimuli. To curate the most relevant content, videos were identified using the keyword “ski resort recommendations” and ranked by “most liked” results. Videos with over 10,000 likes were considered eligible. Given that excessively short videos may fail to comprehensively present ski resort services, while excessively long videos may reduce completion rates, this study selects videos with durations ranging from 30 s to 1 min. Consequently, Study 2 utilizes two videos as experimental materials: one featuring a small ski resort in Henan Province and another showcasing a large ski resort in Jilin Province. We have obtained the necessary usage rights for both videos. These experimental materials are solely employed for data collection purposes and will not be publicly released due to ethical and privacy considerations. In the Supplementary material, we provide a comprehensive textual description of all details presented in the videos, including the narrator’s speech, subtitles, and timestamped visual content.

To ensure measurement validity, Study 2 employs well-established scales from prior domestic and international research. These scales were translated into Chinese using a translation-back translation method and modified based on the research context and expert recommendations from the sports and tourism fields. The questionnaire consists of three main sections: the first section includes the introduction and experimental short videos; the second section comprises measurement scales for various variables; and the third section pertains to the demographic information, including age, gender, disposable income, and so forth. The questionnaire (detailed in Appendix C and Appendix D) employed a series of statements to assess key variables using a seven-point Likert scale. Environmental quality symbols were evaluated through statements such as “The skiing facilities and services presented in the short video are very appealing”^{30,63}. Information quality symbol were evaluated through statements such as “The content of the short video is authentic and credible”^{31,63}. Interaction quality symbol were evaluated through statements such as “The comments and likes on ski tourism short videos are very helpful to me”^{30,64}. Vlogger quality symbol were evaluated through statements such as “The vlogger’s commentary is comfortable and polite”^{32,63}. Service quality symbol were evaluated through statements such as “Ski tourism short videos do not capture my attention”^{31,65}. Behavioral motivation were evaluated through statements such as “I participate in ski tourism because I enjoy the excitement that skiing brings”^{42,66}. Risk perception were evaluated through statements such as “Accidental injuries are prone to occur in ski resorts, posing high risks”^{54,67}. Behavioral intention were evaluated through statements such as “I am willing to spend money and time to actively participate in ski tourism”^{61,68}. To mitigate common method bias, the study implements reverse-coded items and randomized item ordering as precautionary measures.

Data collection and sample analysis

A preliminary survey was conducted in late December 2023 through an online questionnaire distribution. A total of 105 valid responses were collected to assess the reliability and validity of the questionnaire and refine item wording. After eliminating five non-compliant items, 28 items were retained.

The formal survey was conducted in mid-February 2024, in collaboration with three nationally certified travel agencies located in Henan, Shandong, and Anhui provinces. Prior to data collection, scientific sampling protocols were clearly communicated, requiring the even distribution of questionnaires across all survey days. Questionnaires—either in paper form or via QR codes—were administered exclusively to customers who had engaged in ski-related inquiries or bookings. Respondents were instructed to first view the experimental video before completing the questionnaire. In total, 670 questionnaires were distributed, yielding 609 valid responses, resulting in a valid response rate of 90.9%. The demographic characteristics of the respondents are presented in Table 2.

Following data collection, reverse-coded items were adjusted for consistency, and all responses were systematically coded and entered for analysis. The dataset was processed using SPSS 24.0, Amos 24.0, and Mplus 8.0 for statistical analysis. To enhance interpretability and presentation quality, Visio was used for data visualization.

Control and assessment of common method bias

Given that all variables in this study pertain to individual psychological perceptions and are self-reported by participants after watching ski tourism videos, there is a potential risk of Common Method Bias (CMB). To mitigate this issue, both procedural and statistical controls were implemented. To reduce the likelihood of CMB, the following measures were adopted during the survey design: 1.Reverse-coded items were incorporated into the questionnaire to minimize response patterns. 2.Randomized item order was applied to prevent sequence effects. 3.Anonymity assurance was provided to participants before the survey to reduce social desirability bias.

The Harman's single-factor test was conducted using Amos software to evaluate the extent of CMB. All measurement indicators were loaded onto a single latent factor, and the model fit indices were assessed. The results indicated poor model fit: $\chi^2/df=15.114$, GFI=0.498, AGFI=0.418, NFI=0.559, IFI=0.576, TLI=0.541, CFI=0.575, RMR=0.233, RMSEA=0.152. These findings suggest that no single methodological factor accounts for the majority of variance, indicating that CMB is not a significant concern in this study^{69,70}.

Reliability and validity analysis

(1) Reliability Analysis.

The reliability test results are presented in Table 3. The Cronbach's α coefficient for the overall survey scale was 0.925, while the coefficients for individual variables ranged from 0.816 to 0.935, all exceeding the recommended threshold of 0.7. These results indicate a high level of internal consistency among the variables, demonstrating the strong reliability of the survey instrument.

(2) Validity Analysis.

First, an exploratory factor analysis (EFA) was conducted, extracting four common factors: perceived quality symbols(PQS), behavioral motivation(BM), risk perception (RP), and behavioral intention(BI). Given that perceived quality symbols initially yielded only one common factor, a second factor analysis was conducted on its corresponding items. This analysis identified five distinct sub-factors: environmental quality symbols(EQ), informational quality symbols(IfQ), interactive quality symbols(ItQ), Vlogger quality symbols(VQ), and service quality symbols(SQ). As a result, perceived quality symbols were modeled as a second-order reflective latent

Demographic characteristics	Description	Count	Percentage
Gender	Male	297	48.77%
	Female	312	51.23%
Age	Under 17 years old	18	2.96%
	18–25 years old	218	35.80%
	26–35 years old	284	46.63%
	Over 36 years old	89	14.61%
Monthly disposable income	Below 999 yuan	155	25.45%
	1000–1999 yuan	400	65.68%
	2000–2999 yuan	38	6.24%
	3000 yuan and above	16	2.63%
Skiing experience	Never participated	25	4.11%
	1–3 times	268	44.01%
	4–8 times	211	34.65%
	More than 9 times	105	17.24%
Preferred type of ski resort	Medium and small-sized ski parks within the province, daily spending within 500 yuan	304	49.92%
	Large ski resorts within the country, daily spending over 500 yuan	305	50.08%

Table 2. Descriptive characteristics of the participants.

Construct		Item code	Standardization Factor loadings	Crobach's α	AVE	CR
Perceived quality symbol(PQS)	Environmental quality symbol (EQ)	PQ1	0.73	0.816	0.596	0.815
		PQ2	0.748			
		PQ3	0.834			
	Information quality symbol (IfQ)	PQ4	0.86	0.899	0.751	0.9
		PQ5	0.866			
		PQ6	0.873			
	Interaction quality symbol (ItQ)	PQ7	0.77	0.851	0.659	0.853
		PQ8	0.859			
		PQ9	0.804			
	Vlogger quality symbol (VQ)	PQ10	0.814	0.836	0.635	0.839
		PQ11	0.752			
		PQ12	0.822			
	Service quality symbol (SQ)	PQ13	0.746	0.805	0.582	0.807
		PQ14	0.777			
		PQ15	0.765			
Behavioral motivation (BM)		BM1	0.804	0.935	0.712	0.937
		BM2	0.853			
		BM3	0.867			
		BM4	0.897			
		BM5	0.849			
		BM6	0.787			
Risk perception (RP)		PR1	0.786	0.897	0.686	0.897
		PR2	0.842			
		PR3	0.861			
		PR4	0.823			
Behavioral intention (BI)		BI1	0.742	0.852	0.661	0.854
		BI2	0.854			
		BI3	0.839			

Table 3. Results of the reliability and validity analysis.

	EQ	IfQ	ItQ	VQ	SQ	BM	RP	BI
EQ	(0.596)							
IfQ	0.721***	(0.751)						
Itq	0.736***	0.981***	(0.659)					
VQ	0.679***	0.861***	0.895***	(0.635)				
SQ	0.592***	0.675***	0.781***	0.733***	(0.582)			
BM	0.481***	0.45***	0.609***	0.586***	0.466***	(0.712)		
RP	-0.157***	0.073	-0.063	0.022	0.043	-0.268***	(0.686)	
BI	0.509***	0.588***	0.796***	0.632***	0.522***	0.607***	-0.127	(0.611)
Square root of AVE	0.772	0.866	0.812	0.797	0.763	0.844	0.828	0.813

Table 4. Discriminant validity tests. *** $p < 0.01$. Values in () are AVE.

variable. A third EFA was then performed, extracting eight fixed factors, with a cumulative variance explained rate of 68.354%. All factor loadings exceeded 0.5, meeting the validity requirements.

Next, a confirmatory factor analysis (CFA) was conducted using Amos 24.0 to validate the eight latent variables. The model fit indices were as follows: $\chi^2/df = 2.136$, GFI = 0.926, AGFI = 0.907, NFI = 0.943, IFI = 0.969, TLI = 0.963, CFI = 0.969, RMR = 0.060, RMSEA = 0.043. These values indicate a good model fit, confirming strong structural validity of the measurement model.

Finally, as shown in Table 3, the composite reliability (CR) values for all latent variables ranged from 0.807 to 0.937 (exceeding the 0.7 threshold), and the average variance extracted (AVE) values ranged from 0.582 to 0.751 (above the 0.5 standard), demonstrating adequate convergent validity. Additionally, Table 4 shows that the square root of each AVE value was greater than the correlation coefficients between latent variables, indicating satisfactory discriminant validity. In conclusion, the survey instrument exhibits strong reliability and validity, supporting its suitability for further analysis.

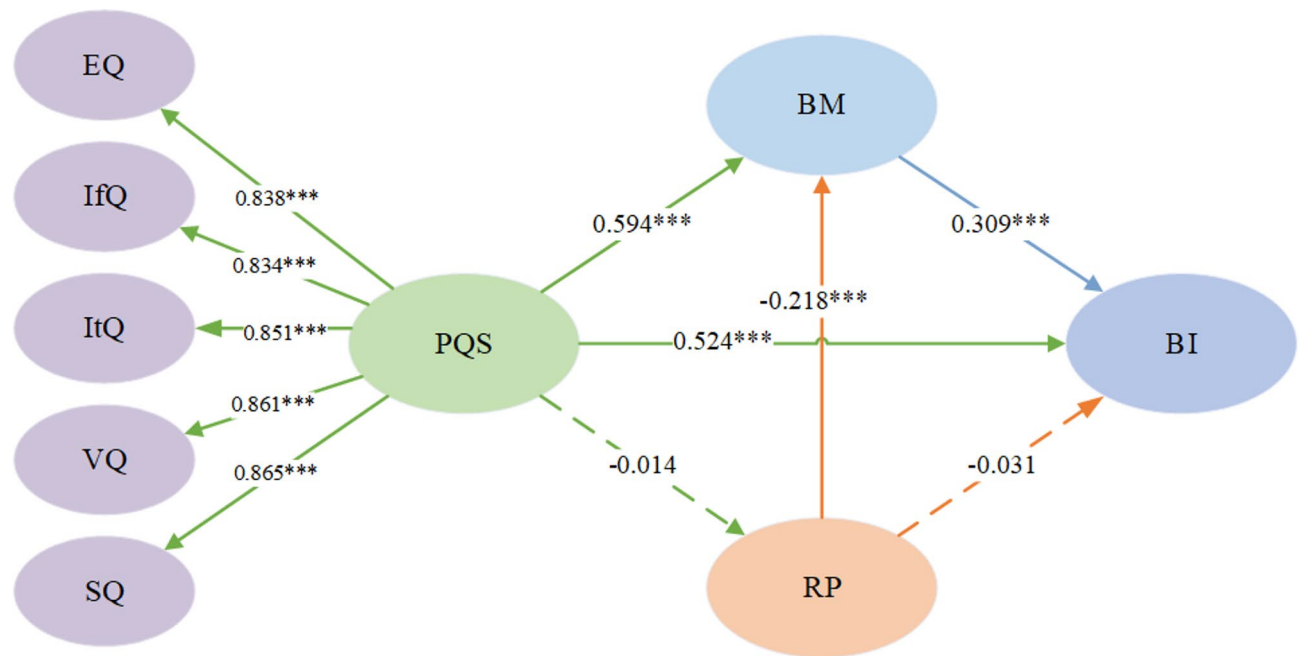


Fig. 2. Hypothesis testing results in the analysis.

Hypotheses	Relationships	Estimate	S.E.	C.R.	P	Decision
H1	PQS→BM	0.594	0.03	19.872	***	Supported
H2	PQS→BI	0.524	0.043	12.291	***	Supported
H3	PQS→RP	-0.014	0.045	-0.307	0.759	Not supported
H4	BM→BI	0.309	0.045	6.813	***	Supported
H5	RP→BM	-0.218	0.036	-6.114	***	Supported
H6	RP→BI	-0.031	0.036	-0.868	0.385	Not supported

Table 5. Hypotheses testing. *** $p < 0.001$.

Results

Structural equation modeling

The structural equation model was constructed using Mplus 8.0, with parameter estimation performed via the maximum likelihood method. The model successfully converged and was identified. The fit indices indicated a good overall model fit: $\chi^2 = 1056.402$, $df = 457$, $\chi^2/df = 2.312$, CFI = 0.949, TFI = 0.945, RMSEA = 0.046, SRMR = 0.058, all meeting the recommended thresholds. Figure 2; Table 5 present the path relationships, standardized coefficients, and hypothesis testing results among the latent variables. The findings are as follows: Perceived quality symbols exerted a significant positive effect on behavioral motivation ($\beta = 0.594$, $p < 0.001$), supporting Hypothesis H1. Perceived quality symbols also had a significant positive effect on behavioral intention ($\beta = 0.524$, $p < 0.001$), supporting Hypothesis H2. However, perceived quality symbols did not have a significant impact on risk perception ($\beta = -0.014$, $p = 0.759$), leading to the rejection of Hypothesis H3. Behavioral motivation showed a significant positive effect on behavioral intention ($\beta = 0.309$, $p < 0.001$), supporting Hypothesis H4. Risk perception had a significant negative effect on behavioral motivation ($\beta = -0.218$, $p < 0.001$), supporting Hypothesis H5. However, risk perception did not have a significant impact on behavioral intention ($\beta = -0.031$, $p = 0.385$), leading to the rejection of Hypothesis H6.

To further explore the sources of risk perception, this study examined the relationship between tourists' skiing experience and perceived risk. Pearson correlation analysis revealed a significant negative correlation between tourists' skiing experience and risk perception ($r = -0.553$, $p < 0.01$).

Mediating Effect of Behavioral Motivation

In the structural equation model, the "Perceived Quality Symbols → Risk Perception → Behavioral Intention" pathway was found to be non-significant. Therefore, mediation analysis focused solely on the effect of behavioral motivation. The bias-corrected non-parametric percentile Bootstrap method was employed with 5,000 resamples to compute a 95% confidence interval (CI). After controlling for gender, age, income, and type, the results (detailed in Table 6) revealed the following: The total effect of perceived quality symbols on behavioral intention was 0.704, with a 95% CI of [0.639, 0.763], excluding 0. The direct effect of perceived quality symbols on behavioral intention was 0.521, with a 95% CI of [0.422, 0.622], excluding 0. The indirect effect mediated

Type	Relationships	Estimate	S.E.	Lower 2.5%	Upper 2.5%	Proportion of effect
Indirect effect	PQ→BM→BI	0.183	0.031	0.124	0.243	25.99%
Direct effect	PQ→BI	0.521	0.052	0.422	0.622	74.01%
Total effect		0.704	0.032	0.639	0.763	

Table 6. Mediating effect test results for behavioral motivation.

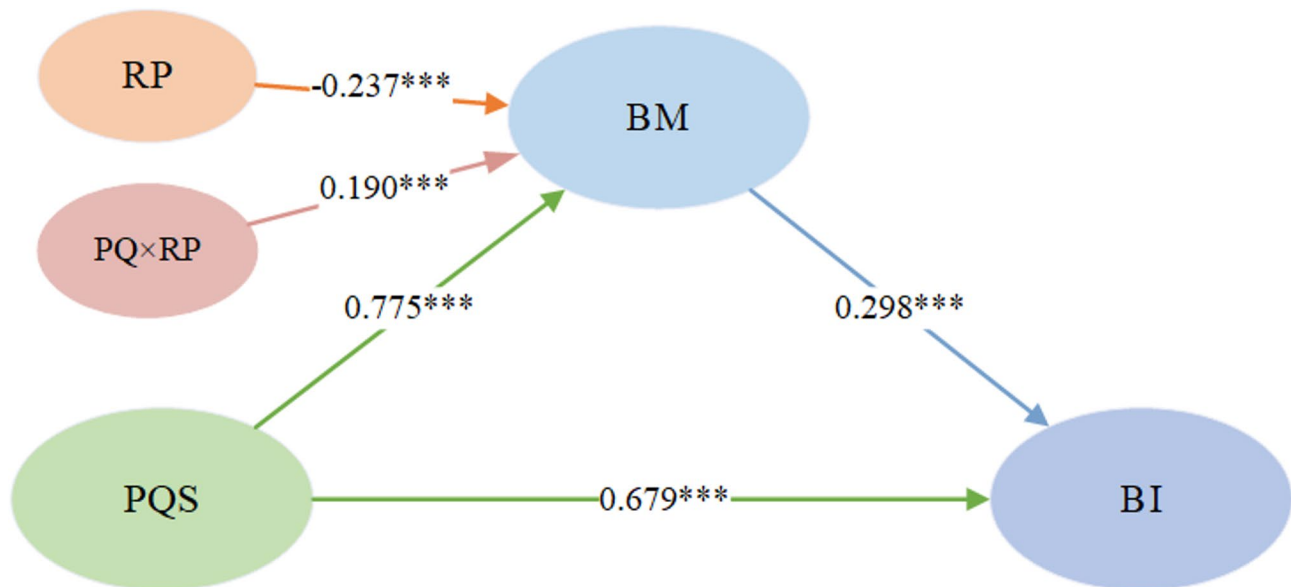


Fig. 3. Moderated mediator model.

by behavioral motivation was 0.183, with a 95% CI of [0.124, 0.243], excluding 0. The proportion of the direct and indirect effects in the total effect was 74.01% and 25.99%, respectively, with 95% CIs not including 0. These results confirm that perceived quality symbols influence behavioral intention both directly and indirectly through behavioral motivation, providing further empirical support for Hypotheses H1 and H4.

Moderated mediation effect of risk perception

To examine the moderating role of risk perception in the first half of the mediation model (PQS→BM→BI), a Latent Moderated Structural Equations model (LMS) was constructed following established methods^{71,72}.

Initially, a baseline model without interaction terms was developed, yielding a satisfactory model fit ($\chi^2 = 1012.149$, $df = 444$, $\chi^2/df = 2.280$, CFI = 0.952, TFI = 0.947, RMSEA = 0.046, SRMR = 0.056). Subsequently, a moderated mediation model was constructed by incorporating an interaction term (Perceived Quality Symbols × Risk Perception), with model comparison conducted using Akaike Information Criterion (AIC) and likelihood ratio tests. The results indicated that adding the latent interaction term improved model performance. The AIC of the moderated mediation model (46,278.634) was lower than that of the baseline model (46,295.606), reflecting an improvement of 16.972. Moreover, the log-likelihood of the moderated mediation model (-23,036.317) was higher than that of the baseline model (-23,045.803), with a -2LL difference of 9.486. Given an additional degree of freedom ($df = 1$), the chi-square test for -2LL was statistically significant ($p < 0.001$), confirming that the moderated mediation model provided a superior fit compared to the baseline model.

To further validate the significance of the latent moderation effect, a bias-corrected non-parametric percentile Bootstrap method with 5,000 resamples was applied to estimate the 95% confidence interval (CI). The results (Fig. 3) demonstrated that after controlling for gender, age, income, and ski resort type, the interaction effect of risk perception on the relationship between perceived quality symbols and behavioral motivation was significant ($\beta = 0.190$, $p < 0.001$, 95% CI = [0.092, 0.285], excluding 0). To further explore the nature of this moderation, risk perception scores were categorized into high ($M + 1$ SD) and low ($M - 1$ SD) groups, allowing for a simple slope analysis. As shown in Fig. 4, when risk perception was high, perceived quality symbols had a stronger impact on behavioral motivation. Conversely, when risk perception was low, the relationship between perceived quality symbols and behavioral motivation weakened. Notably, even at low levels of risk perception, behavioral motivation remained relatively high.

Discussion

Study 2, building upon the theoretical framework and hypotheses established in Study 1, conducted a quantitative empirical analysis to examine the impact of perceived quality symbols in short-video social media on tourists' ski

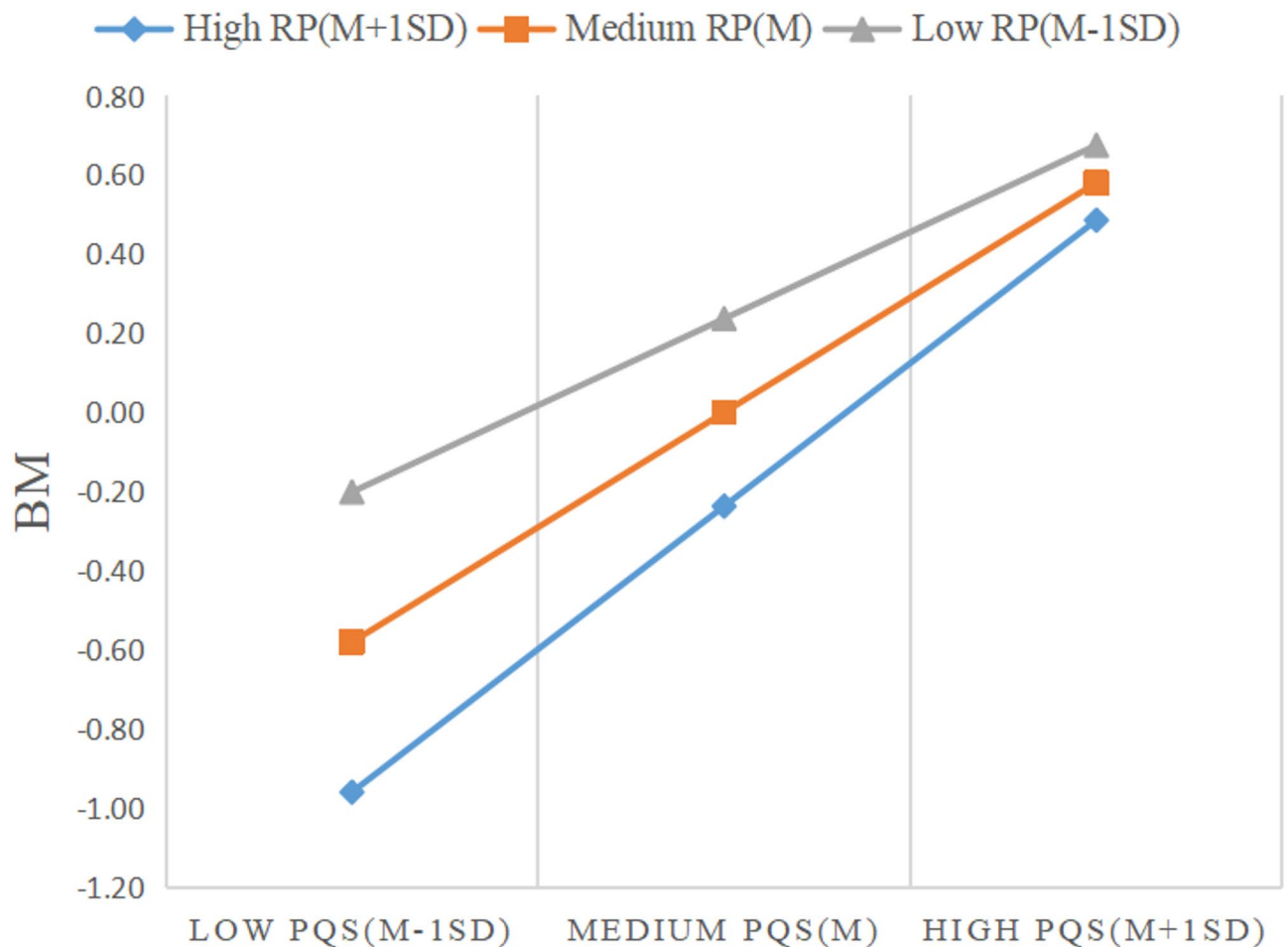


Fig. 4. Simple slope analysis of risk perception.

tourism behavior. By constructing a structural equation model, we examined the relationships among perceived quality symbols, risk perception, behavioral motivation, and behavioral intention. Study 2 addressed Research Questions 2 and 3, providing robust empirical evidence to advance the theoretical understanding of semiotics in tourism behavior.

The findings revealed that perceived quality symbols have a strong and significant positive impact on both behavioral motivation ($\beta = 0.594, p < 0.001$) and behavioral intention ($\beta = 0.524, p < 0.001$). This suggests that high-quality symbolic representations, such as visually appealing ski resorts, positive reviews, and influencers showcasing exciting skiing experiences, enhance tourists' intrinsic motivation to participate in ski tourism. These results align with previous studies highlighting the role of media representations in influencing travel decisions^{73–75}. The mediation analysis revealed that perceived quality symbols significantly influence behavioral intention both directly ($\beta = 0.521, 95\% \text{ CI } [0.422, 0.622]$) and indirectly ($\beta = 0.183, 95\% \text{ CI } [0.124, 0.243]$) through behavioral motivation. The total effect of perceived quality symbols on behavioral intention ($\beta = 0.704, 95\% \text{ CI } [0.639, 0.763]$) further underscores their pivotal role in shaping tourists' decision-making processes, corroborating the above findings.

Moreover, the significant positive relationship between behavioral motivation and behavioral intention ($\beta = 0.309, p < 0.001$) suggests that higher motivation levels directly translate into a stronger intention to engage in ski tourism. This finding is consistent with the perspective that motivation is a key antecedent of behavioral intention^{48,50,76}. Notably, in the mediation analysis, direct and indirect effects accounted for 74.01% and 25.99% of the total effect, respectively, highlighting the crucial role of motivation in ski tourism decision-making.

Interestingly, perceived quality symbols did not significantly affect risk perception ($\beta = -0.014, p = 0.759$). These findings suggest that although the quality symbols conveyed in short videos can enhance positive emotional and cognitive responses, they do not significantly alter tourists' perceptions of the inherent risks associated with skiing activities. In other words, tourism risks—such as those related to weather conditions, ski resort safety infrastructure, and individual risk tolerance—are likely influenced more by the actual environment and personal experiences than by the visual cues presented in the videos⁷⁷.

However, Risk perception was found to have a significant negative impact on behavioral motivation ($\beta = -0.218, p < 0.001$). This indicates that individuals who perceive higher risks associated with ski tourism—such as injuries, costs, or unpredictable weather conditions—are less motivated to participate. This finding is consistent

with prior research emphasizing the deterrent effect of perceived risks in adventure tourism⁵⁸. The study found that risk perception does not significantly influence behavioral intention ($\beta = -0.031$, $p = 0.385$, leading to the rejection of Hypothesis H6). This unexpected result suggests that while risk perception reduces motivation, it does not necessarily prevent individuals from forming an intention to visit ski destinations⁷⁸.

The results demonstrated that risk perception significantly moderated the relationship between perceived quality symbols and behavioral motivation ($\beta = 0.190$, $p < 0.001$, 95% CI = [0.092, 0.285]), illustrating that the impact of perceived quality symbols on behavioral motivation varies depending on tourists' perceived risk levels. This finding aligns with previous research conclusions that highlight the moderating role of risk perception in tourism behavior^{79,80}.

The simple slope analysis provided deeper insights into the nature of this moderation. Specifically, when risk perception was high ($M + 1$ SD), perceived quality symbols had a stronger effect on behavioral motivation, suggesting that tourists who are more aware of risks are more likely to be influenced by quality cues in short video content. Conversely, when risk perception was low ($M - 1$ SD), the effect of perceived quality symbols on behavioral motivation was weaker. This indicates that for individuals who already perceive skiing as relatively safe, quality representations in short videos serve as a reinforcement rather than a decisive factor in driving motivation. Notably, even at low levels of risk perception, behavioral motivation remained relatively high, implying that ski tourism has inherent appeal for some individuals regardless of risk concerns.

Conclusion and prospects

Conclusion

Grounded in semiotic theory, this study explores the underlying mechanisms through which short-video social media influences ski tourism behavior. Employing both qualitative (Study 1) and quantitative (Study 2) approaches, we developed and empirically tested a theoretical model. The key findings are as follows:

This study constructs the “Perceived Quality Symbols–Motivation–Behavior” model by integrating semiotic theory with ski tourists' consumption behaviors in short-video social media contexts. The results indicate that perceived quality symbols significantly and positively influence both behavioral motivation and behavioral intention, while risk perception has a negative influence on behavioral motivation. This model extends the application of semiotic theory in tourism research and provides a theoretical support for targeted marketing strategies in short-video-based promotions and ski tourism.

Perceived quality symbols play an important role in shaping ski tourists' decision-making processes on short-video platforms. Five dimensions—environmental quality symbols, informational quality symbols, interactive quality symbols, vlogger quality symbols, and service quality symbols—collectively shape tourists' perceptions of ski tourism. These symbols not only influence destination recognition but also shape consumer expectations. Authentic information presentation, highly interactive content, and professional narration further enhance tourists' trust in destinations, collectively fostering positive perceptions and contributing to tourism behavior.

Short-video social media can stimulate behavioral motivation, which, in turn, influences behavioral intention. Behavioral motivation serves as a partial mediator between perceived quality symbols and behavioral intention, offering additional understanding into tourists' decision-making processes within the context of short-video media. This finding suggests the role of high-quality video content in enhancing tourists' motivation, thereby increasing their travel intentions.

Given that ski tourism is generally perceived as high-risk activity, risk perception plays a significant role in consumer decision-making. Key concerns among tourists include environmental risks, facility risks, management risks, and sports-related risks. The findings indicate a negative correlation between tourists' risk perception and their prior skiing experience, indicating that individuals with more experience tend to perceive lower levels of risk. Although risk perception does not directly impact behavioral intention, its moderating effect on the “Perceived Quality Symbols → Behavioral Motivation” pathway suggests that elevated risk perception increases the demand for authenticity in quality symbols. Specifically, tourists with limited skiing experience and elevated risk perception are more likely to be influenced by the authenticity of symbolic cues presented in short-video social media, thereby exhibiting more pronounced motivation toward ski tourism.

These findings provide valuable theoretical and practical implications for short-video marketing and ski tourism management, offering further insights into the role of semiotics in consumer decision-making.

Theoretical and practical implications

This study advances theoretical and practical understanding of how short-video social media shapes ski tourism behavior through a semiotic lens. Theoretically, it extends symbolic interaction theory into the dynamic, multimedia-driven digital era, demonstrating that perceived quality symbols—spanning environmental, informational, interactive, vlogger, and service dimensions—actively construct tourists' cognitive and emotional responses. Drawing on the concepts of intrinsic and extrinsic motivation from Self-Determination Theory, this study tentatively integrates these constructs with semiotic theory. It offers a preliminary examination of the role of motivation in ski tourism behavior within the context of short-video social media, providing novel insights into high-risk tourism decision-making processes. This bridges gaps in prior literature, which predominantly focused on static symbols, by highlighting the role of dynamic visual narratives in shaping consumption psychology. Furthermore, the identification of risk perception as a moderator underscores the dual role of symbolic authenticity: while high-quality symbols enhance motivation, excessive idealization may amplify risk perception when expectations diverge from reality. These insights enrich interdisciplinary dialogues between media studies, tourism research, and behavioral psychology.

Limitations and future research

This study has certain limitations that should be addressed in future research. Firstly, due to time and geographical constraints, the sample for this study was relatively narrow, consisting of only three tourism agencies from three provinces in China. Future research could expand both the sample size and geographical scope to enhance the reliability and generalizability of the findings. Secondly, the short videos used in this study were created by sports tourism vloggers with significant followings, each having tens of thousands of fans and high engagement rates. However, the influence and audience reach of these vloggers may still be limited. Future studies could consider factors such as influencer impact, regional characteristics, and climatic conditions to provide a more comprehensive understanding of how ski tourism symbols are perceived and evaluated. Lastly, this study focused primarily on behavioral intention, which may not fully align with actual behavior. Future research could adopt longitudinal designs to explore the complex mechanisms that translate intentions into real-world actions.

Data availability

Due to confidentiality agreements with participants and institutional ethics requirements, the Study 1 dataset containing personal information cannot be made publicly available, but may be made available upon reasonable request to the corresponding author. The dataset from Study 2 is publicly available in the Open Science Framework repository at <https://osf.io/hdar5/>.

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References

- Xiang, Z. & Gretzel, U. Role of social media in online travel information search. *Tour Manag.* **31**, 179–188 (2010).
- Perez-Vega, R., Taheri, B., Farrington, T. & O’Gorman, K. On being attractive, social and visually appealing in social media: the effects of anthropomorphic tourism brands on Facebook fan pages. *Tour Manag.* **66**, 339–347 (2018).
- Zeng, B. & Gerritsen, R. What do we know about social media in tourism? A review. *Tour Manag Perspect.* **10**, 27–36 (2014).
- Hildebrandt, C. et al. Accident prevention on ski slopes – perceptions of safety and knowledge of existing rules. *Accid. Anal. Prev.* **43**, 1421–1426 (2011).
- Luque Martínez, T., Doña Toledo, L. & Faraoni, N. Auditing marketing and the use of social media at ski resorts. *Sustainability* **11**, 2868 (2019).
- Yüksel, A. & Akgül, O. Postcards as affective image makers: an idle agent in destination marketing. *Tour Manag.* **28**, 714–725 (2007).
- Gazley, A. & Watling, L. Me, my tourist-self, and I: the symbolic consumption of travel. *J. Travel Tour Mark.* **32**, 639–655 (2015).
- Ekinci, Y., Sirakaya-Turk, E. & Preciado, S. Symbolic consumption of tourism destination brands. *J. Bus. Res.* **66**, 711–718 (2013).
- Wang, Z. Body symbols and Circle-layer relationship: reasons and ethics in ‘Micro-community’: based on creation, Thumb-up and comments of short sports Video[身体符号与圈层关系: 微社群中的情理与人伦——基于体育类短视频的创作、点赞与评论]. *J. Shanghai Univ. Sport.* **46**, 22–33 (2022).
- Echtner, C. M. The semiotic paradigm: implications for tourism research. *Tour Manag.* **20**, 47–57 (1999).
- MacCannell, D. Staged authenticity: arrangements of social space in tourist settings. *Am. J. Sociol.* **79**, 589–603 (1973).
- Yang, J. & Xi, Y. Symbol authenticity perception of tourism experience Research[符号感知下的旅游体验真实性研究]. *J. Beijing Int. Stud. Univ.* **37**, 34–39 (2015).
- Steiger, R., Scott, D., Abegg, B., Pons, M. & Aall, C. A critical review of climate change risk for ski tourism. *Curr. Issues Tour.* **22**, 1343–1379 (2019).
- Steiger, R. & Stötter, J. Climate change impact assessment of ski tourism in Tyrol. *Tour Geogr.* **15**, 577–600 (2013).
- Yang, J. & Wan, C. Progress in research on the impacts of global climate change on winter ski tourism. *Adv. Clim. Change Res.* **1**, 55–62 (2010).
- Steiger, R., Posch, E., Tappeiner, G. & Walde, J. The impact of climate change on demand of ski tourism - a simulation study based on stated preferences. *Ecol. Econ.* **170**, 106589 (2020).
- Steiger, R. & Scott, D. Ski tourism in a warmer world: increased adaptation and regional economic impacts in Austria. *Tour Manag.* **77**, 104032 (2020).
- Moreno-Gené, J., Daries, N. & Cristóbal-Fransi, E. Sánchez-Pulido, L. Snow tourism and economic sustainability: the financial situation of ski resorts in Spain. *Appl. Econ.* **52**, 5726–5744 (2020).
- Moreno-Gené, J., Sánchez-Pulido, L., Cristóbal-Fransi, E. & Daries, N. The economic sustainability of snow tourism: the case of ski resorts in Austria, France, and Italy. *Sustainability* **10**, 3012 (2018).
- Hudson, S. The ‘greening’ of ski resorts: A necessity for sustainable tourism, or a marketing opportunity for skiing communities? *J. Vacat Mark.* **2**, 176–185 (1996).
- Bausch, T. & Unseld, C. Winter tourism in Germany is much more than skiing! Consumer motives and implications to alpine destination marketing. *J. Vacat Mark.* **24**, 203–217 (2018).
- Alexandris, K., Kouthouris, C. & Meligdis, A. Increasing customers’ loyalty in a skiing resort: the contribution of place attachment and service quality. *Int. J. Contemp. Hosp. Manag.* **18**, 414–425 (2006).
- Pröbstl-Haider, U. & Haider, W. Tools for measuring the intention for adapting to climate change by winter tourists: some thoughts on consumer behavior research and an empirical example. *Tour Rev.* **68**, 44–55 (2013).
- Yang, Y., Sun, X., Hu, L., Ma, Y. & Bu, H. How ski tourism involvement promotes tourists’ low-carbon behavior? *Sustainability* **15**, 10277 (2023).
- Huang, S. The impact of ski servicescape on tourist loyalty: evidence from Chinese market. *Curr. Issues Tour.* **28**, 220–239 (2025).
- Marine-Roig, E. & Martín-Fuentes, E. Daries-Ramon, N. User-generated social media events in tourism. *Sustainability* **9**, 2250 (2017).
- Hennink, M. & Kaiser, B. N. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Soc. Sci. Med.* **292**, 114523 (2022).
- Goulding, C. Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research. *Eur. J. Mark.* **39**, 294–308 (2005).
- Corbin, J. & Anselm, S. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (Sage, 2014).
- Liu, H. & Yan, M. Influence of mobile Short-form video on tourist behavioral intentions [移动短视频使用对旅游者行为意愿的影响研究]. *Tour Trib.* **36**, 62–73 (2021).
- Lu, Y. Anhui University, Research on the Mechanism of the Influence of the Quality of Live Streaming Service on Consumers Repeated Purchase Intention [直播营销服务质量对消费者重复购买意愿的影响机制研究]. (2022). <https://doi.org/10.26917/d.cnki.ganhu.2022.001542>

32. Wang, T. Study on Consumer Purchase Intention Under E-commerce Live Streaming Context [电商直播情境下消费者购买意愿研究] (Minzu University of China, 2020). <https://doi.org/10.27667/d.cnki.gzymu.2020.000209>
33. Kim, D. Y., Lehto, X. Y. & Morrison, A. M. Gender differences in online travel information search: implications for marketing communications on the internet. *Tour Manag.* **28**, 423–433 (2007).
34. Qiu, L., Li, X. & Choi, S. Exploring the influence of short video platforms on tourist attitudes and travel intention: A social-technical perspective. *J. Destin. Mark. Manag.* **31**, 100826 (2024).
35. Sun, P., Shao, S., Shi, J. & Kang, W. Formation mechanism of TikTok users' travel behavior: an exploration study based on grounded theory [基于扎根理论的短视频抖音用户出游行为形成机理研究]. *Chin. J. Manag.* **17**, 1823–1830 (2020).
36. Buckley, R. Rush as a key motivation in skilled adventure tourism: resolving the risk recreation paradox. *Tour Manag.* **33**, 961–970 (2012).
37. Cui, F., Liu, Y., Chang, Y., Duan, J. & Li, J. An overview of tourism risk perception. *Nat. Hazards.* **82**, 643–658 (2016).
38. Rogers, R. W. A protection motivation theory of fear appeals and attitude Change1. *J. Psychol.* **91**, 93–114 (1975).
39. Rogers, R. W. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. *Soc. Psychol. Source Book* 153–176 (1983).
40. Yang, Q., Mukambaeva, I., Mukambaev, N., Yan, S. & Zhang, T. Exploring university students' sports tourism behavior: based on structural equation model. in (2023). <https://doi.org/10.11159/cist23.119>
41. Lin, C., Yang, Z. & Huang, X. Psychological Dictionary [心理学大辞典] (Shanghai Education, 2003).
42. Alexandris, K., Kouthouris, C., Funk, D. & Giovani, C. Segmenting winter sport tourists by motivation: the case of recreational skiers. *J. Hosp. Mark. Manag.* **18**, 480–499 (2009).
43. Kerr, J. H. & Houge Mackenzie, S. Multiple motives for participating in adventure sports. *Psychol. Sport Exerc.* **13**, 649–657 (2012).
44. Deci, E. L. & Ryan, R. M. The general causality orientations scale: Self-determination in personality. *J. Res. Personal.* **19**, 109–134 (1985).
45. Zhao, Y., Zhang, Z., Liu, N. & Ding, M. A. Literature review on new development of Self-Determination theory [自我决定理论的新发展述评]. *Chin. J. Manag.* **13**, 1095–1104 (2016).
46. Pelletier, L. G. et al. Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: the sport motivation scale (SMS). *J. Sport Exerc. Psychol.* **17**, 35–53 (1995).
47. Vallerand, R. J. & Losier, G. F. An integrative analysis of intrinsic and extrinsic motivation in sport. *J. Appl. Sport Psychol.* **11**, 142–169 (1999).
48. Funk, D. C., Beaton, A. & Alexandris, K. Sport consumer motivation: autonomy and control orientations that regulate fan behaviours. *Sport Manag. Rev.* **15**, 355–367 (2012).
49. Deci, E. L. & Ryan, R. M. *Intrinsic Motivation and Self-Determination in Human Behavior* (Springer Science & Business Media, 2013).
50. Alexandris, K., Kouthouris, C. & Girgolas, G. Investigating the relationships among motivation, negotiation, and alpine skiing participation. *J. Leis. Res.* **39**, 648–667 (2007).
51. Kouthouris, C. An examination of the relationships between motivation, involvement and intention to continuing participation among recreational skiers. *Int. J. Sport Manag. Recreat. Sport.* **4**, 1–19 (2010).
52. Li, G., Cheng, Y. & Cai, J. Study of risk perception consumption behavior of sports tourism in China. *PLOS ONE.* **18**, e0288735 (2023).
53. Fuchs, G. & Reichel, A. An exploratory inquiry into destination risk perceptions and risk reduction strategies of first time vs. repeat visitors to a highly volatile destination. *Tour Manag.* **32**, 266–276 (2011).
54. Quintal, V. A., Lee, J. A. & Soutar, G. N. Risk, uncertainty and the theory of planned behavior: A tourism example. *Tour Manag.* **31**, 797–805 (2010).
55. Plank, A. The hidden risk in user-generated content: an investigation of ski tourers' revealed risk-taking behavior on an online outdoor sports platform. *Tour Manag.* **55**, 289–296 (2016).
56. Xu, H., Xu, S. & Wang, R. Study on dimension identification and variance analysis of consumers' perceived risk in travel [消费者旅游感知风险维度识别及差异分析]. *Tour Trib.* **28**, 71–80 (2013).
57. Choo, H. K., Choo (Clara), Y. & Kang, H. M. Do sport tourists' perceived risks affect their involvement and intention to (re)visit? An empirical study for risk-reduction strategies. *Int. J. Sports Mark. Spons.* **17**, 19–36 (2016).
58. Mason, M. C., Gos, L. & Moretti Andrea. Motivations, perceived risk and behavioural intentions in hard adventure tourism. A natural park case study. *Sinergie Ital. J. Manag.* 181–199. <https://doi.org/10.7433/s100.2016.11> (2018).
59. Carter, M. J. & Fuller, C. Symbols, meaning, and action: the past, present, and future of symbolic interactionism. *Curr. Sociol.* **64**, 931–961 (2016).
60. Yang, Y. & Zhang, L. The development mode of digital media Art based on semiotic perspective. *Front Art Res* **6**, 51–55 (2024).
61. Abdalla Mikhail, C. & Baskerville, R. L. Using semiotics to analyze representational complexity in social media. *Inf. Organ.* **29**, 100271 (2019).
62. Yu, X. 2022 China Short Video Industry Development Report [2022 年中国短视频行业发展报告] (Social Science Literature Publishing House, 2023).
63. Cronin, J. J. & Taylor, S. A. Measuring service quality: A reexamination and extension. *J. Mark.* **56**, 55–68 (1992).
64. Ghose, S. & Dou, W. Interactive functions and their impacts on the appeal of internet presence sites. *J. Advert. Res.* **38**, 29–43 (1998).
65. Parasuraman, A., Zeithaml, V. A. & Berry, L. L. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *J. Retail.* **64**, 12 (1988).
66. Ma, P., Zhang, R. & Li, L. Motivation of enduring skiing consumption from the perspective of Self-determination theory [自我决定理论视角下驱动持续性滑雪消费的动机研究]. *J. Tianjin Univ. Sport.* **33**, 485–491 (2018).
67. Tan, B. & Wang, L. Research on the motivation of sports tourism participation of college students in Shanghai based on Multi - Group structural equation model [基于多群组结构方程模型的上海市大学生体育旅游参与行为动机研究]. *J. Jilin Sport Univ.* **37**, 47–55 (2021).
68. Lowe, B. & Alpert, F. Forecasting consumer perception of innovativeness. *Technovation* **45–46**, 1–14 (2015).
69. Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y. & Podsakoff, N. P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **88**, 879–903 (2003).
70. Zhou, H. & Long, L. Statistical remedies for common method biases [共同方法偏差的统计检验与控制方法]. *Adv Psychol. Sci.* **6**, 942–950 (2004).
71. Fang, J. & Wen, Z. The analyses of moderated mediation effects based on structural equation modeling [基于结构方程模型的有调节的中介效应分析]. *J. Psychol. Sci.* **41**, 453–458 (2018).
72. Maslowsky, J., Jager, J. & Hemken, D. Estimating and interpreting latent variable interactions: A tutorial for applying the latent moderated structural equations method. *Int. J. Behav. Dev.* **39**, 87–96 (2015).
73. Jiang, J., Hong, Y., Li, W. & Li, D. A study on the impact of official promotion short videos on tourists' destination decision-making in the post-epidemic era. *Front. Psychol.* **13**, 1015869 (2022).
74. Wu, S. & Peng, X. How can short travel videos facilitate tourists' decision-making about traveling to cultural heritage destinations? Evidence from the Wudang mountain complex. *Asia Pac. J. Mark. Logist.* <https://doi.org/10.1108/APJML-05-2024-0577> (2025).
75. Yang, Z., Wang, S. & Yoon, T. The effect of short-form video on travel decision-making process: an integration of AIDA and MGB models. *Int. J. Tour Res.* **26**, e2632 (2024).

76. Nagy, K. Z., Tóth, K., Gyömbér, N., Tóth, L. & Bánhid, M. Motives underlying water sport tourist behaviour: A segmentation approach. *World Leis J.* **63**, 109–127 (2021).
77. Reisinger, Y. & Mavondo, F. Travel anxiety and intentions to travel internationally: implications of travel risk perception. *J. Travel Res.* **43**, 212–225 (2005).
78. Shah Alam, S., Masukujjaman, M., Omar, N. A., Makhbul, M., Helmi Ali, M. & Z. K. & Protection motivation and travel intention after the COVID-19 vaccination: fear and risk perception. *J. Qual. Assur. Hosp. Tour.* **24**, 930–956 (2023).
79. Luong, T. B. & Nguyen, D. T. A. The moderating role of risk perception in the relationships between motivation, attitude, and involvement in adventure activities: A study from young Vietnamese travelers. *J. Qual. Assur. Hosp. Tour.* 1–25. <https://doi.org/10.1080/1528008X.2024.2338779> (2024).
80. Antari, K. A. A., Agustina, N. K. W. & Yudhistira, P. G. A. the influence of risk perception on visit decision to tourism village: the mediating role of tourist motivation. *Int. J. Soc. Sci. Bus.* **7**, 947–956 (2023).

Author contributions

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Declarations

Competing interests

The authors declare no competing interests.

Ethical statement

This study was conducted using data obtained solely through independent fieldwork carried out by the authors. This study has been reviewed and approved by the academic committee of Luoyang Normal University, and all methods were performed in accordance with the relevant guidelines and regulations. Informed consent was obtained from all subjects involved in the study.

Additional information

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