

Traditional Chinese medicine health literacy health beliefs and hot spring use in relation to perceived health maintenance

Xiaoyi Xu¹, Songyu Jiang^{2*}, Jirawan Deeprasert³

¹²³ Rattanakosin International College of Creative Entrepreneurship, Rajamangala University of Technology
Rattanakosin, Nakhon Pathom 73170, Thailand

Xiaoyi Xu: xu.xiaoyi@rmutr.ac.th; Songyu Jiang: jiang.song@rmutr.ac.th; Jirawan Deeprasert: jirawan.dee@rmutr.ac.th
Corresponding author: Songyu Jiang, jiang.song@rmutr.ac.th

Abstract

This study examines how traditional Chinese medicine health literacy (TCM-HL), together with selected components of the Health Belief Model, is associated with health-oriented hot spring use and perceived health maintenance among adult hot spring users in China. Specifically, it investigates the roles of perceived benefit, cues to action, and TCM-HL and examines whether health-oriented hot spring use carries their indirect associations with perceived health maintenance. A questionnaire survey was conducted with 750 adult hot spring users in China. The hypothesized relationships were examined using covariance-based structural equation modeling (CB-SEM), and indirect associations were evaluated using 5,000-resample bias-corrected bootstrapping. The results show that perceived benefit ($\beta = .285, p < .001$), cues to action ($\beta = .224, p < .001$), and TCM-HL ($\beta = .248, p < .001$) were positively associated with health-oriented hot spring use. Among these three antecedents, perceived benefit showed the strongest association with health-oriented hot spring use, followed by TCM-HL and cues to action. Health-oriented hot spring use, in turn, showed a particularly strong positive association with perceived health maintenance ($\beta = .506, p < .001$), representing the largest focal structural coefficient in the model. Bootstrap analysis further identified positive indirect associations of perceived benefit ($\beta = .144$), TCM-HL ($\beta = .126$), and cues to action ($\beta = .113$) with perceived health maintenance through health-oriented hot spring use, with all bias-corrected 95% confidence intervals excluding zero. The findings extend a focused application of the Health Belief Model by demonstrating the relevance of culturally situated health-information capability alongside supportive appraisal and perceived professional prompting in explaining wellness-service participation. For hot spring and wellness service providers, the results highlight the importance of understandable health information, clearly identifiable professional guidance, and communication that supports informed participation. Because perceived health maintenance represents respondents' subjective attribution rather than independently verified clinical improvement, the findings should be interpreted as behavioral and perceptual associations rather than evidence of therapeutic efficacy.

Keywords: traditional Chinese medicine health literacy; health belief model; hot spring use; perceived health maintenance; complementary health practice.

How to cite this article: Xiaoyi Xu. Traditional Chinese medicine health literacy health beliefs and hot spring use in relation to perceived health maintenance. *Int J Drug Deliv Technol.* 2026;16(86s):14-32. DOI: 10.25258/ijddt.16.86s.3.

1 Introduction

Hot spring bathing occupies a distinctive position in health-oriented service consumption. A visitor can describe the same activity as recreation, bodily relaxation, preventive self-care, or support for recovery. These purposes often coexist within one trip, but they imply different reasons for participation and different interpretations of its consequences. Wellness tourism research describes experiences that combine physical, psychological, social, and environmental dimensions, rather than a single treatment outcome (Dini & Pencarelli, 2022; Liao et al., 2023; Martins et al., 2025). Travel research similarly connects restorative experiences with perceived health and well-being (Chen & Petrick, 2013). The practical question is consequently broader than whether visitors enjoy bathing. It concerns how people come to regard bathing as relevant to maintaining health and which beliefs and capabilities accompany that interpretation.

Evidence from Thailand provides a useful neighboring service context. Research at Doi Saket hot springs examined visitors' satisfaction with service processes and environmental management and identified

stakeholders' interest in distinctive health-promotion activities (Phakdeephirot, 2021). The distinction matters here because satisfaction with a service environment and attribution of health maintenance are related but different outcomes. The present study asks how beliefs and information capability accompany health-oriented use, rather than assuming that a well-managed destination necessarily produces a medical benefit. The Thai evidence informs the service context; it does not substitute for measurement or clinical evidence in the Chinese sample.

An attractive wellness service can encourage participation without supplying a clear understanding of its appropriate role. A person can expect benefit from a pleasant environment, perceive encouragement from professionals, and still have difficulty distinguishing general wellness communication from evidence about a particular intervention. Another person can understand the available information but decide that an advertised service does not fit their circumstances. These possibilities expose a theoretical tension between favorable appraisal and informed action. An account

based entirely on positive beliefs risks treating approval as information competence. An account based entirely on literacy risks overlooking the motivational and social conditions under which information becomes relevant to a voluntary activity.

Clinical bathing research establishes a reason to take health-oriented use seriously while also setting limits on interpretation. Recent systematic reviews examine balneotherapy for osteoarthritis, fibromyalgia, and chronic low back pain (García-López et al., 2024; Mao et al., 2023; Protano et al., 2023). These reviews concern different populations, treatment protocols, comparison conditions, and endpoints. A broader review of rheumatological applications reports important uncertainty in the evidence (Aribi et al., 2025), while an updated review of Hungarian clinical trials evaluates a geographically specific body of interventions (Bender et al., 2026). Such evidence provides a clinical context for studying health-related beliefs. It does not demonstrate that ordinary leisure bathing produces equivalent outcomes or that a visitor's favorable rating measures therapeutic improvement.

Related evidence also covers warm bathing and habitual tub bathing outside destination-based wellness services. A systematic review of passive body heating addresses sleep outcomes (Haghighat et al., 2019), and a prospective observational study examines habitual tub bathing in relation to cardiovascular events (Ukai et al., 2020). These practices overlap physically with some hot spring experiences but differ in setting, exposure, supervision, and outcome assessment. The present study therefore concentrates on perceived health maintenance: respondents' attribution of supportive value to their use of hot springs. This outcome is meaningful for understanding consumer experience and self-care orientation, but it remains distinct from clinically assessed changes in pain, disease progression, or functional capacity.

The health belief model offers a useful foundation for examining such participation. It explains health-related action through appraisals of benefits, barriers, threats, and activating cues, with later developments incorporating learning and efficacy-related considerations (Rosenstock et al., 1988). A meta-analysis establishes the relevance of benefit beliefs to behavioral prediction (Carpenter, 2010). Communication research further demonstrates that the model's components can be examined within alternative explanatory arrangements rather than treated as an undifferentiated list (Jones et al., 2015). Its application to complementary and alternative medicine use among people with diabetes illustrates its relevance beyond conventional preventive services (Tehrani et al., 2022). However, the model's evaluative components do not by themselves establish whether a respondent can understand, appraise, and apply health information.

Health literacy supplies that capability perspective. Its development extends beyond basic reading competence

to the communicative and critical capacities involved in making health-related decisions (Nutbeam, 2000; Sørensen et al., 2012). Evidence on low literacy and health outcomes reinforces the importance of accessible information (Berkman et al., 2011), while the social-determinant perspective places literacy within unequal opportunities to access and use services (Nutbeam & Lloyd, 2021). Recent reviews connect literacy with self-care in chronic illness and examine literacy interventions in diabetes management (Butayeva et al., 2023; Magi et al., 2026). These literatures support an information-capability explanation of participation, although their findings cannot be transferred directly to leisure bathing or interpreted as proof that literacy invariably increases service use.

Traditional Chinese medicine health literacy is particularly relevant to decisions made within a culturally plural health environment. Research on health literacy in China describes an evolving field that encompasses public communication, healthcare navigation, and population capability (Y. Li et al., 2022). A TCM-specific perspective emphasizes the interpretation of health concepts and information within that medical tradition (Qian et al., 2023). Recent studies examine rural older adults, the relationship between cultural promotion and health status, and the coexistence of modern medical and TCM literacy (Mi et al., 2025; H. Zhang et al., 2024; X. Zhang et al., 2024). This evidence makes culturally specific information capability a plausible contributor to health-oriented service choices, but it also raises questions about what the construct measures and how closely it fits a particular behavior.

The measurement problem is consequential. A person can recognize traditional practices, express respect for cultural heritage, or believe strongly in advertised benefits without demonstrating information literacy. Conversely, critical appraisal can produce selective refusal of a service. A scoping review of TCM health-literacy instruments identifies limitations in their conceptual and psychometric coverage (Qian et al., 2024). Work on cultural and conceptual knowledge similarly emphasizes that meaning and understanding form part of the literacy problem (Buki et al., 2024). The present framework therefore treats literacy as the ability to work with relevant information rather than as endorsement of a medical tradition or another favorable attitude toward bathing.

Ordinary hot spring use must also be distinguished from a specifically TCM-based intervention. Mineral-water bathing, recreational spa services, medically supervised balneotherapy, herbal bathing, and traditional therapeutic practices have different characteristics. The cultural relevance of TCM literacy does not make every sampled hot spring facility a TCM provider. The question investigated here is whether a culturally relevant information capability accompanies health-oriented use, after service-benefit appraisal and

perceived professional encouragement are considered. This formulation connects the literacy literature with wellness participation while preserving the boundary between a behavioral explanation and a medical classification.

Three research questions organize the study. First, how are perceived benefit and professionally oriented cues to action associated with health-oriented hot spring use? Second, does TCM health literacy show an association with such use when the two belief-related antecedents are considered together? Third, does hot spring use carry indirect associations between these antecedents and perceived health maintenance? These questions give the five constructs distinct roles. Perceived benefit captures supportive evaluation; cues to action capture perceived professional prompting; literacy captures information capability; use represents engagement; and maintenance represents the perceived outcome attributed to that engagement.

The study contributes a focused theoretical comparison within one model rather than adding variables solely to increase complexity. Benefits and cues are selected positive components of the health belief model; barriers, susceptibility, severity, awareness, and contextual moderators are outside the focal specification. This choice narrows the explanatory claim. It does not amount to a complete test of the health belief model or demonstrate that excluded constructs are unimportant. Including direct antecedent-to-maintenance paths also prevents the model from presuming that participation accounts for every relationship between beliefs, literacy, and attributed maintenance.

The empirical study examines 750 adult hot spring users and reports measurement reliability, correlations, focal structural paths, and bootstrap indirect associations. Its explanatory aim is to distinguish what users regard as beneficial, what makes participation salient, and what enables them to interpret relevant information. The model therefore links service appraisal and perceived professional prompting with a culturally situated information capability. It preserves perceived maintenance as the final outcome and asks whether engagement provides a common statistical connection. This approach makes the behavioral contribution assessable without equating a favorable self-report with clinical efficacy or treating a significant literacy coefficient as proof that all relevant capability has been captured.

2 Theoretical framework and hypotheses

2.1 A focused account of supportive beliefs and information capability

The health belief model is used as a selective framework for voluntary health-oriented participation. Perceived benefits concern the anticipated value of an option, whereas cues to action concern prompts that make a response salient. Their roles differ from perceived threat, which concerns vulnerability and severity, and from barriers, which concern the obstacles to acting

(Carpenter, 2010; Rosenstock et al., 1988). The present model asks a specific question about supportive evaluations and professional prompting. Its use of selected components should therefore be judged against that question rather than against the expectation that every health-belief dimension must appear in every empirical specification.

Within this account, literacy adds a capability dimension. Information access and appraisal help a participant interpret an option, compare claims, and understand how an activity fits ongoing self-care (Nutbeam, 2000; Sørensen et al., 2012). They are conceptually separable from thinking that the service is beneficial or that professionals encourage supportive practices. A respondent can hold favorable beliefs with limited comprehension, or possess strong comprehension without favorable beliefs. Estimating all three antecedents together tests whether their reported relationships contain distinguishable explanatory information, although coefficient significance alone does not settle their conceptual independence.

This arrangement does not assume that literacy moderates the relationship between benefits and participation. Neither does it assume that benefits create literacy or that professional cues precede every change in literacy. Such claims introduce additional mechanisms and temporal requirements that the present summaries do not test. The model instead places the three antecedents alongside one another and allows for their covariance. Hot spring use forms the common intervening construct, and direct associations with maintenance remain in the outcome equation. This specification accommodates shared explanatory pathways without forcing complete mediation.

2.2 Perceived benefit and health oriented hot spring use

Perceived benefit concerns the value attached to a health-related option. When individuals view a service as useful for their ongoing self-care, participation can seem worth its costs in time, effort, and resources. The meta-analytic evidence on health-belief components supports the behavioral relevance of benefit appraisal (Carpenter, 2010). Research applying that model to complementary medicine use supplies a related context in which expected value contributes to voluntary health choices (Tehrani et al., 2022). These sources justify the proposed association but do not establish the magnitude expected among hot spring users.

The retained benefit items require a precise definition. They describe improvements in service environments, participation opportunities, available resources, and supportive healthcare settings. Their documented source is a study of residents' support for health and wellness tourism development (L. Li et al., 2025). Consequently, the construct is better understood as perceived health-supportive service benefit than as a narrowly validated measure of personal clinical efficacy. Its behavioral relevance lies in the perceived availability and

usefulness of an environment in which health-oriented activity can take place. Describing it as certainty that bathing cures a condition would exceed its item content. Wellness tourism research supports attention to service systems rather than isolated treatments. A holistic account includes the organization and combination of experiences that make wellness participation meaningful (Dini & Pencarelli, 2022), while research on transformative wellness tourism emphasizes participants' broader aspirations (Voigt et al., 2011). A favorable assessment of resources and opportunities can therefore make bathing seem compatible with a health-maintenance routine. This reasoning is particularly relevant where users combine leisure and self-care rather than enter a formally prescribed treatment program.

The proposed relationship remains vulnerable to retrospective appraisal. Frequent users can develop favorable evaluations after participation, and people who already regard bathing positively can select into the sample. The hypothesis is therefore expressed as an association in the available design. It does not presume that modifying benefit communication will produce a corresponding increase in behavior. The retained item wording and the model's observational character define the scope of the claim.

H1: Perceived benefit is positively associated with health-oriented hot spring use.

2.3 Cues to action and health oriented hot spring use

Cues to action make a health option noticeable and actionable. They can include recommendations, reminders, information encounters, or encouragement that connects a general concern with a concrete response. In communication applications of the health belief model, these prompts help explain why an appraisal becomes relevant to action (Jones et al., 2015). Professional guidance has particular theoretical value when an optional activity is presented as supportive care, because users must interpret its relationship with other health decisions rather than merely decide whether it is enjoyable.

The retained cue items measure respondents' perceptions of what medical professionals emphasize, encourage, and help manage. They do not establish that each respondent received individualized advice. This distinction matters because perceived professional endorsement can operate as a general legitimacy signal even in the absence of a personal consultation. The construct is therefore described as perceived professional encouragement and guidance. It should not be equated with verified clinical recommendation, physician-prescribed bathing, or the appropriateness of participation for a specific respondent.

Professional cues can clarify why a practice is framed as complementary, make health maintenance salient, and increase confidence in seeking an informed explanation. Their relationship with use is nevertheless conditional on the content and credibility of the guidance. A

professional signal that discourages participation under certain circumstances can produce less use. The positive hypothesis concerns the supportive wording captured by the retained scale, rather than the effect of all professional communication regardless of content.

The item provenance reinforces this qualification. The source cited in the earlier questionnaire concerned travel behavior and authority-related signals during and after COVID-19 (Thotongkam et al., 2023). Recasting those signals as medical encouragement is a substantial contextual adaptation. The statistical results must therefore be accompanied by a content-based account of what the adapted items capture. Subject to that interpretation, stronger perceptions of supportive professional guidance are expected to accompany greater health-oriented use.

H2: Professionally oriented cues to action are positively associated with health-oriented hot spring use.

2.4 Traditional Chinese medicine health literacy and hot spring use

Health literacy involves the ability to obtain, understand, appraise, and apply information in making health-related decisions (Sørensen et al., 2012). Its functional, interactive, and critical aspects extend beyond recognizing a familiar term or reporting confidence (Nutbeam, 2000). Within TCM, this capability includes interpreting relevant concepts and deciding how information fits a person's health context (Qian et al., 2023). A culturally specific measure is therefore intended to capture meaningful information competence rather than general educational attainment or simple recognition of complementary therapies.

There are several reasons to expect literacy to accompany health-oriented bathing. Information competence can make it easier to locate relevant explanations, distinguish a supportive practice from a substitute for other care, and understand the limits of advertised claims. It can also help a person relate bathing to an existing self-care routine. Reviews linking literacy and self-care in chronic illness support this capability argument at a broader level (Magi et al., 2026), and intervention evidence in diabetes management demonstrates the relevance of understandable information to health-related practice (Butayeva et al., 2023). The hot spring hypothesis extrapolates a behavioral rationale from these literatures; it does not transfer their clinical outcomes to the present sample.

Evidence on complementary medicine and literacy is context dependent. Studies of chronically ill outpatients and parents' use of honey and other complementary practices examine populations and decisions that differ from wellness visitors (Dehghan et al., 2023; Tek Ayaz, 2023). They show why it is useful to examine literacy alongside beliefs, but they also caution against treating all complementary practices as one behavior. The consequences of understanding information depend on the type of practice, available evidence, accessibility,

and the question being decided. Greater literacy can support appropriate engagement or appropriately restrained use.

Research within China further establishes cultural relevance without providing a universal behavioral coefficient. Studies of rural older adults and dual modern-medical and TCM literacy describe uneven information capability across populations (Mi et al., 2025; H. Zhang et al., 2024). Work examining TCM cultural promotion and health status raises a related question about how cultural exposure connects with comprehension (X. Zhang et al., 2024). The present article extends the inquiry to health-oriented bathing, where culturally familiar self-care ideas can supply an interpretive context for a service that is not necessarily delivered as formal TCM treatment.

The positive hypothesis is limited to the observed engagement outcome. It does not imply that more use is always better, that literacy should be increased to maximize sales, or that refusal indicates inadequate understanding. Critical literacy can lead to skepticism or selective nonparticipation. Because the sample consists of people with bathing experience, a positive association can reflect informed engagement within a group already open to the activity. Testing this relationship among nonusers would require a broader sampling frame.

H3: Traditional Chinese medicine health literacy is positively associated with health-oriented hot spring use.

2.5 Hot spring use and perceived health maintenance

Hot spring use is the intervening construct because engagement connects an appraisal of a service with an experience to which supportive value can be attributed. The retained items capture routine, preventive, recovery-oriented, and relaxation-related participation. They measure respondents' orientation toward bathing as part of self-care rather than independently recorded exposure. Perceived health maintenance then captures the extent to which respondents attribute ongoing physical, psychological, and functional support to that practice. The relationship is therefore between two reported constructs that must remain distinguishable in the measurement model.

Wellness research describes perceived benefits across several dimensions (Liao et al., 2023), while an observational retreat study evaluates changes in multiple aspects of health and well-being (Cohen et al., 2017). Research on restorative environments also examines how participants interpret wellness destinations (Jeong, 2024). These studies support investigating experience-related maintenance perceptions, but their designs and interventions differ. The proposed association concerns respondents' current reports of use and attributed support, without asserting that participation caused measured improvement.

Clinical reviews supply a complementary boundary. Studies of osteoarthritis, fibromyalgia, and low back pain concern specified clinical outcomes (García-López

et al., 2024; Mao et al., 2023; Protano et al., 2023). Their findings cannot validate every favorable health attribution made by recreational users. A positive use-maintenance relationship can involve relaxation, routine formation, experiential satisfaction, and retrospective interpretation alongside any genuine physical response. The present measures cannot isolate these components or distinguish them from selection into bathing.

An especially important issue is shared item content. Use statements mention maintenance and recovery, while maintenance statements explicitly attribute support to hot spring therapy. This similarity creates a risk that some covariance reflects language or a general favorable orientation. Measurement-model evidence and the comparison of distinct versus merged factors therefore form part of the interpretation of H4 rather than an optional statistical appendix. Even satisfactory distinction would support a relationship between constructs, not a clinical efficacy claim.

H4: Health-oriented hot spring use is positively associated with perceived health maintenance.

2.6 Indirect associations through hot spring use

The model proposes three parallel indirect associations through the same intervening construct. Perceived benefit makes participation appear valuable; perceived professional cues make supportive action salient; literacy supplies information capability. Each antecedent can therefore relate to maintenance perceptions partly through its relationship with reported use. The indirect hypothesis does not add a sixth variable or require an assumed ordering among the three antecedents. It connects their distinct theoretical roles to one common form of engagement.

The model proposes three parallel indirect associations through the same intervening construct. Perceived benefit makes participation appear valuable; perceived professional cues make supportive action salient; literacy supplies information capability. Each antecedent can therefore relate to maintenance perceptions through its relationship with reported use. The indirect hypotheses are evaluated as statistical associations and do not require direct antecedent-to-maintenance effects to be estimated or interpreted.

Bootstrap estimation is appropriate for uncertainty in indirect products (Preacher & Hayes, 2008). The three indirect estimates are the products of the corresponding antecedent-use coefficient and the use-maintenance coefficient. Their scale must be stated clearly: standardized products should be compared with standardized direct paths, and unstandardized products with unstandardized paths. Resampling-based intervals provide evidence about statistical compatibility with zero. They do not establish temporal precedence or remove confounding.

Cross-sectional mediation requires particular caution because longitudinal processes can be misrepresented by contemporaneous relationships (Maxwell & Cole, 2007). Participants' perceived maintenance can

encourage continued use, and prior use can strengthen benefits or literacy through experience. These alternatives are not eliminated by a significant indirect estimate. The hypotheses are consequently phrased as indirect associations and interpreted within the observed covariance structure.

H5: Hot spring use carries a positive indirect association between perceived benefit and perceived health maintenance.

H6: Hot spring use carries a positive indirect association between cues to action and perceived health maintenance.

H7: Hot spring use carries a positive indirect association between traditional Chinese medicine health literacy and perceived health maintenance.

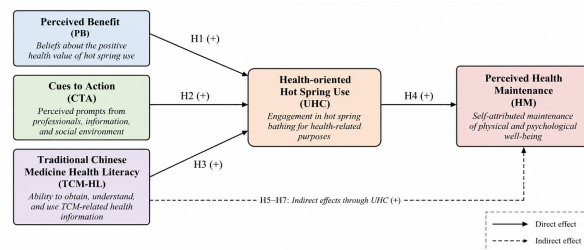


Figure 1. Conceptual framework

Figure 1 presents the conceptual framework of this study, which integrates selected components of the Health Belief Model with traditional Chinese medicine health literacy to explain health-oriented hot spring use and perceived health maintenance. Specifically, perceived benefit (PB), cues to action (CTA), and traditional Chinese medicine health literacy (TCM-HL) are proposed to be positively associated with health-oriented hot spring use (UHC), corresponding to H1 – H3. Health-oriented hot spring use is subsequently proposed to be positively associated with perceived health maintenance (HM), as specified in H4. In addition, H5 – H7 propose that UHC carries the indirect associations of PB, CTA, and TCM-HL with perceived health maintenance. Accordingly, the framework positions health-oriented hot spring use as the central intervening construct connecting supportive health beliefs and culturally relevant information capability with respondents' perceived health maintenance.

3 Method

3.1 Research design and study context

The study uses a single-wave cross-sectional questionnaire design among 750 adults with hot spring experience in China. Recruitment was conducted online in a multi-location context covering Guangdong, Jiangsu, Liaoning, Chongqing, and Beijing. The retained health-belief items, use and maintenance measures, and TCM literacy questions were administered in the same survey wave. No location-specific allocation is reported, so the setting is described as geographically varied rather than regionally balanced or nationally representative.

The analytical focus is health-oriented engagement and perceived maintenance. Respondents were not assigned to a standardized intervention, and the study does not compare treatment and control groups. It evaluates contemporaneous relationships among beliefs, literacy, use, and maintenance within the participating user sample. Simultaneous administration clarifies that literacy was not appended as a later follow-up outcome, but it does not establish an antecedent-engagement-outcome temporal sequence. An observational interpretation therefore remains appropriate for both direct paths and indirect associations.

The available documentation supports a nonprobability account of recruitment rather than a random-sampling claim. Inclusion depends on participation in the questionnaire and previous experience with bathing. This design is useful for studying users' interpretations, but it excludes people who never participated and can favor respondents with greater interest in wellness services. Sampling limitations remain relevant even with 750 cases. A larger sample improves precision under a model; it does not correct selection into the sampling frame or make the respondents representative of all Chinese adults.

The sample includes adults aged 60 years and over, accounting for 10.0% of cases. The population should therefore be described as adult hot spring users rather than restricted to working-age adults. Likewise, the principal trip purposes include leisure and relaxation as well as health management and recovery support. The recruitment account should distinguish eligibility based on bathing experience from an analytical assumption that every participant originally attended for medical purposes. The UHC scale measures the strength of a health-oriented interpretation within this heterogeneous user group.

3.2 Participants and sample adequacy

Table 1 summarizes gender, age, education, use frequency, and primary trip purpose. Each block sums to 750 respondents, and percentages agree with the counts after rounding. This distribution defines the current analytical sample. A response rate is not calculated because the recruitment denominator is unavailable. Sample provenance and the full screening flow should accompany the archived survey and analysis records; the final valid count alone does not establish whether differently described analytical samples contain identical respondents.

Sample adequacy in SEM depends on the parameterization, loading strengths, residual variation, missingness, and effect sizes (Wolf et al., 2013). A general respondent-to-item ratio cannot establish power for every indirect path. Guidance on sample-size justification also distinguishes precision, feasibility, and power arguments (Lakens, 2022). The current sample gives a substantial empirical basis for a focused model, but the reporting does not include a prospective power calculation. A retrospective statement that the study was

designed with a particular power is therefore unsupported.

For future replication, Monte Carlo methods can assess power for the indirect pathways under realistic assumptions (Schoemann et al., 2017). Such planning should use plausible antecedent-use and use-maintenance paths, allow for measurement error, and account for incomplete observations. It should not simply treat the observed significant coefficients as guaranteed population parameters. For the present article, the final count and the reported standard errors provide evidence about the precision of the supplied results, while selection and model specification remain relevant limitations.

3.3 Retained questionnaire measures

Four constructs use the retained questionnaire wording reproduced in Appendix A. Perceived benefit, cues to action, and health-oriented hot spring use each have four items; perceived health maintenance has six. These 18 statements use seven-point agreement responses from 1, strongly disagree, to 7, strongly agree. All are positively keyed, and higher values represent stronger endorsement. TCM literacy contributes a separate 36-item instrument with its own original scoring, giving 54 substantive questionnaire items in total. The literacy score is aggregated before entry into the structural model; its 36 questions are not added as 36 separate structural predictors.

The benefit items concern the supportive service environment, opportunities, resources, and healthcare-related facilities. They originated through substantial adaptation of residents' tourism-development evaluations (L. Li et al., 2025). The cue items concern perceived professional emphasis, encouragement, confidence, and guidance, with an adaptation source involving travel-related authority signals (Thotongkam et al., 2023). The behavioral items recast preventive-action content from a healthcare-worker COVID-19 study into hot spring participation (Limkunakul et al., 2022). The maintenance items drew on an assistance-needs assessment for home-dwelling older adults (Huang et al., 2025). These sources document provenance; they do not establish that the revised wording retains the original scales' validity.

The adaptations therefore require more than a citation to an existing publication. Content review should establish the fit of each statement with the new construct and the target population. The reported CFA and reliability evidence address the statistical structure of the adapted responses but do not show how respondents understood every statement. General guidance on scale development supports combining content assessment, response-process evidence, and empirical validation (Boateng et al., 2018). The article accordingly uses precise labels that follow the retained item content rather than assigning broader medical meanings to convenient abbreviations.

Perceived maintenance remains the final dependent variable. Its six statements ask users to attribute physical stability, daily health management, functioning, recovery, and longer-term support to bathing. They are not objective health observations and do not ask for an independently verified change from baseline. Preserving this measure meets the study's focused design goal but also preserves its interpretive limits. Neither better fit nor higher internal consistency can convert it into a clinical endpoint.

3.4 Traditional Chinese medicine health literacy

TCM health literacy was measured through a 36-item health information literacy instrument based on R. Zhang and colleagues (R. Zhang et al., 2019). The named content domains are cognition, information retrieval, appraisal, application, and information ethics. In this setting, cognition concerns understanding relevant information; retrieval concerns obtaining it; appraisal concerns judging its quality; application concerns using it in decisions; and information ethics concerns responsible handling of health information. These domains situate the predictor in information capability rather than simple approval of traditional medicine. The domains are aggregated into one continuous structural predictor, preserving the focused model rather than adding separate antecedents for each domain.

The administration description identifies five-point responses, from 1, strongly disagree, to 5, strongly agree. Summing 36 responses gives an original possible range of 36–180. Let S denote that sum and $X_5 = S/36$ the corresponding item mean. The composite entered into the model is $X_7 = 1.5X_5 - 0.5$, equivalently $X_7 = 1 + 6(S - 36)/144$. This linear transformation maps the endpoints to 1 and 7. It preserves respondents' order and Pearson correlations and does not change standardized path coefficients under an otherwise identical model. It changes the units of unstandardized coefficients and their standard errors, which is why the entered scoring metric must be explicit.

The current composite mean is 5.08, its standard deviation is 0.89, and the 36-item internal-consistency estimate is $\alpha = .912$. These sample estimates are distinct from reliability in the original development study. Rescaling permits a common display range alongside the agreement constructs, but it does not turn literacy into a single agreement item or make the constructs substantively interchangeable. Nor does it establish score normality or the equivalence of information domains.

The TCM health literacy measure is treated as a 36-item composite based on the cited instrument source. Because the present analysis uses the aggregate score rather than a separately identified latent measurement model, the administered questionnaire and scoring record should be retained with the study documentation for reproducibility.

TCM literacy is an observed composite in the structural model. Its underlying item reliability can be reported, but a factor loading, CR, or AVE is not assigned to the single aggregate score. This choice leaves the predictor's measurement error outside a separately identified latent measurement model. It should not be mistaken for perfect reliability. A sensitivity analysis using a defensible latent structure or a prespecified error correction could examine that limitation, but no such analysis is claimed here. The TCM measurement review supports careful attention to content and psychometric coverage (Qian et al., 2024).

3.5 Descriptive and measurement analysis

Descriptive analysis was conducted in IBM SPSS Statistics 26, and covariance-based structural modeling used IBM SPSS Amos 26 with maximum likelihood estimation. The retained data contain complete responses because the online questionnaire required item completion. No imputation was applied within the final 750 cases. The analysis description specifies Mahalanobis-distance screening at $p < .001$ before retention of the final sample. This rule identifies unusual multivariate response patterns rather than proving that every retained observation is typical. The number of screened and excluded submissions and the variable set used for the distance calculation remain necessary for a reproducible participant-flow account.

All retained agreement statements were positively keyed, so no reverse scoring was applied. In the measurement model, the unstandardized loading of the first indicator of each latent construct, PB1, CTA1, UHC1, and HM1, was fixed to 1 for scaling. TCM literacy was entered as the continuous observed composite described above. These identification choices distinguish four multi-indicator latent constructs from the observed literacy predictor. They do not support describing the structural model as five latent factors.

Distributional screening considered item skewness and kurtosis. The analysis description reports absolute skewness below 1.5 and absolute kurtosis below 2. Such univariate summaries do not establish multivariate normality. Maximum likelihood inference should therefore be evaluated alongside local diagnostics and the bootstrap results rather than justified by a claim that modest univariate values prove the full distributional assumption. No Mardia coefficient or robust maximum likelihood correction is reported, and neither is inferred from the supplied bounds.

The measurement evaluation separates reliability from validity. Coefficient alpha summarizes internal consistency under particular assumptions. Reliability guidance recommends attention to omega and the fitted measurement structure rather than treating alpha as a universal quality index (Flora, 2020; McNeish, 2018). Alpha, CR, and AVE are reported for PB, CTA, UHC, and HM, whereas only underlying item alpha is assigned to the observed literacy composite. Omega is not reported. This distinction prevents a convenient

aggregate score from being presented as a validated single-indicator factor.

Convergent evidence is evaluated through standardized loading ranges and AVE for the four latent constructs. Discriminant evidence is examined using their correlations and square roots of AVE. The revised matrix does not report HTMT, so older HTMT values are not combined with the revised measurement results. HTMT can complement a measurement evaluation when calculated from an identified indicator arrangement (Henseler et al., 2015), but that requires the corresponding item-level data and specification. A published threshold alone cannot validate an unreported calculation.

Measurement evaluation is based on the reported reliability, loading ranges, AVE, and construct correlations for the four latent constructs. TCM health literacy is treated separately as an observed composite. No global CFA fit statistics are reported here because the available fit summary cannot be unambiguously matched to this four-latent-construct-plus-composite specification.

3.6 Structural specification and indirect estimation

The proposed structural model contains two equations. Health-oriented hot spring use is regressed on perceived benefit, cues to action, and TCM literacy. Perceived health maintenance is regressed on use and on the three antecedents. The antecedents are allowed to covary, reflecting the possibility that favorable service appraisals, professional encouragement, and information capability coexist. H1–H4 concern the focal direct paths. H5–H7 concern the products connecting each antecedent with maintenance through use. The additional antecedent-to-maintenance paths prevent complete mediation from being imposed by omission.

The path table reports unstandardized coefficients B , their standard errors, standardized coefficients β , maximum likelihood critical ratios, and p values. The critical ratio is the coefficient divided by its standard error. Under the stated estimation framework, it is interpreted using an asymptotic normal reference rather than a finite-sample t distribution. The reported ratios agree with the rounded B and SE values. Standardized paths describe conditional model associations and remain different from observed bivariate correlations or experimental effects.

Indirect uncertainty was evaluated with 5,000 bootstrap resamples and bias-corrected 95% confidence intervals. The administration and analysis description identifies the indirect points, bootstrap standard errors, and confidence limits as fully standardized effects from the same type of output. The corresponding two-tailed bootstrap p value is reported as .001 for each pathway. This is an explicitly supplied p value, not one reconstructed from the exclusion of zero by a 95% interval. The table therefore preserves $p = .001$ rather than substituting $p < .001$.

Using rounded focal coefficients, the standardized products are $.285 \times .506 = .14421$ for PB, $.224 \times .506 = .113344$ for CTA, and $.248 \times .506 = .125488$ for literacy. The first two round to the reported .144 and .113. The last rounds to .125 when the displayed component values alone are used; underlying components that round to .248 and .506 can yield a product rounding to .126. Accordingly, the literacy difference does not by itself demonstrate a contradictory estimate. Unrounded parameter output is the appropriate basis for exact arithmetic and bootstrap reporting.

The indirect effects are interpreted on the fully standardized metric reported in the bootstrap output. Because matching direct antecedent-to-maintenance coefficients from the same fitted model are not available in the retained results, mediated proportions and partial-mediation classifications are not reported.

The study does not report covariate-adjusted paths, cluster-robust inference, out-of-sample prediction, or subgroup invariance. These analyses are not presumed from the use of structural equation modeling. Any later demographic comparison should establish measurement comparability before interpreting coefficient differences (Putnick & Bornstein, 2016). The model remains a focused explanatory account of reported covariance rather than a predictive evaluation or a test of a temporally identified causal process.

3.7 Shared measurement influences

All agreement measures rely on respondents' descriptions of health-oriented services and experiences. The 36 literacy items were completed in the same survey wave. Shared reporting can therefore generate covariance through response style, retrospective consistency, and related favorable wording. Simultaneous measurement clarifies data collection but offers no temporal separation to reduce these influences. High internal consistency does not identify the size of a method effect.

The comparison with a single-factor model tests whether one undifferentiated factor adequately represents the reported measurement structure. A poor single-factor fit is useful evidence against that particular simplification. It does not establish that common method bias is absent or negligible. Recent methodological analysis emphasizes the complexity of method effects and the limitations of simple remedies (Podsakoff et al., 2024). Shared measurement influences consequently remain a limitation of the behavioral interpretation.

4 Results

4.1 Participant profile

Table 1 presents the current demographic and behavioral distribution for all 750 cases. Women account for 54.4% of respondents and men for 45.6%. The largest age category is 30–44 years, with 298 cases or 39.7%. Adults aged 45–59 account for 25.6%, those aged 18–29 for 24.7%, and those aged 60 or over for 10.0%. The distribution therefore includes substantial

variation across adult life stages rather than describing an exclusively young or older user population.

Table 1

Participant demographic characteristics and bathing profile N = 750

Characteristic	Category	n	%
Gender	Male	342	45.6
	Female	408	54.4
Age	18–29 years	185	24.7
	30–44 years	298	39.7
	45–59 years	192	25.6
	60 years and over	75	10.0
Education	High school or vocational school or below	112	14.9
	Junior college	195	26.0
	Bachelor's degree	368	49.1
	Postgraduate degree	75	10.0
Use frequency	1–2 times per year	230	30.7
	3–5 times per year	315	42.0
	Monthly or more often	205	27.3
Primary trip purpose	Leisure and relaxation	285	38.0
	Health management and wellness	320	42.7
	Chronic-condition management and recovery support	145	19.3

Note. Categories within each characteristic sum to 750. Percentages are rounded. Trip purpose and frequency describe reported participation and are distinct from the four-item UHC construct.

Educational attainment is concentrated in the bachelor's-degree category, comprising 368 respondents or 49.1%. A further 26.0% report junior-college education, 14.9% high-school or vocational-school education or below, and 10.0% postgraduate education. This profile is relevant to a literacy study because the sample contains considerable formal education. It does not show that education and TCM literacy are interchangeable or that each educational group is adequately represented in the population. No subgroup literacy comparison is available in the supplied summaries.

Bathing frequency varies within the sample. The largest category, three to five visits per year, includes 42.0% of

cases. One to two annual visits account for 30.7%, while monthly use or more accounts for 27.3%. These categories describe the respondents' reported frequency and should not be treated as a clinically established dose. The frequency distribution also differs conceptually from the four-item UHC construct, which asks about purpose and health-oriented routine as well as regular participation.

The primary trip-purpose distribution is especially informative for the study's behavioral positioning. Health management and wellness account for 42.7%, leisure and relaxation for 38.0%, and chronic-condition management or recovery support for 19.3%. The sample therefore includes users whose principal motivation is leisure even though they can attach health-supportive meanings to participation. This mixture supports examining variation in health-oriented use instead of presuming that every visitor received treatment. Trip purpose remains descriptive; it is not introduced as an additional latent variable or a tested moderator.

4.2 Reliability and convergent evidence

Table 2 summarizes the revised reliability and convergent-validity estimates. PB has standardized loadings from .762 to .841, $\alpha = .875$, CR = .878, and AVE = .643. CTA has loadings from .738 to .825, $\alpha = .852$, CR = .856, and AVE = .598. UHC has loadings from .781 to .856, $\alpha = .881$, CR = .884, and AVE = .656. HM has loadings from .725 to .819, $\alpha = .894$, CR = .896, and AVE = .589. The loading ranges and construct-level estimates summarize the measurement evidence for the retained indicators.

Table 2

Revised reliability and convergent validity of the latent constructs

Construct	Items	Loading range λ	α	CR	AVE
PB	4	.762–.841	.875	.878	.643
CTA	4	.738–.825	.852	.856	.598
UHC	4	.781–.856	.881	.884	.656
HM	6	.725–.819	.894	.896	.589
TCM-HL ¹	36	N/A	.912	N/A	N/A

Note. PB = perceived benefit; CTA = cues to action; UHC = health-oriented hot spring use; HM = perceived health maintenance; TCM-HL = traditional Chinese medicine health literacy. CR = composite reliability; AVE = average variance extracted. ¹ TCM-HL is one observed composite calculated from 36 items; its alpha concerns the administered 36-item set. Loading, CR, and AVE are not applicable to the aggregate as a single structural predictor. Agreement constructs use 1–7 responses. The literacy instrument originally uses 1–5 responses, with its item mean transformed to 1–7 as $X7 = 1.5X5 - 0.5$.

All reported loading ranges indicate substantial relationships between items and their respective factors. CR exceeds .85 for every latent construct, and the AVE estimates exceed .50. Within the specified measurement arrangement, these results support internal consistency and convergent evidence. They do not establish that the scales are interchangeable with the original published instruments or that similarly worded items necessarily capture fully independent content. Content and response-process evidence remain relevant to the substantial adaptations.

The literacy measure has $\alpha = .912$ for its 36 constituent items. A loading range, CR, and AVE are not assigned to the observed aggregate. Its reliability can be higher than that of a shorter agreement scale without demonstrating greater construct validity, because alpha depends partly on item number and covariance. Literacy is not treated as perfectly measured. Its observed-composite status is maintained consistently in the measurement table, correlation matrix, and model diagram.

4.3 Construct associations and discriminant evidence

Table 3 presents the revised construct descriptives and correlation matrix. PB has $M = 5.12$ and $SD = 0.92$; CTA has $M = 4.85$ and $SD = 0.98$; UHC has $M = 4.96$ and $SD = 1.05$; and HM has $M = 5.32$ and $SD = 0.86$. The literacy composite has $M = 5.08$ and $SD = 0.89$. Thus, HM has the highest displayed mean among these measures, and CTA the lowest. The common 1–7 display range facilitates reading but does not justify treating differences in means as differences in the amount of a single underlying property.

Table 3

Revised construct descriptives and correlations

Construct	M	SD	1	2	3	4	5
1 PB	5.12	.92	.802				
2 CTA	4.85	.98	.425*	.773			
3 UHC	4.96	1.05	.482*	.410*	.810		
4 HM	5.32	.86	.512*	.455*	.538*	.767	
5 TCM-HL	5.08	.89	.388*	.362*	.405*	.421*	N/A

Note. Below-diagonal entries are reported correlations. Bold diagonal entries are the square roots of revised AVE for PB, CTA, UHC, and HM. TCM-HL is an observed composite, so an AVE-based diagonal is not assigned. HTMT is not reported in the revised matrix. The literacy descriptive values follow the composite measurement description. *** $p < .001$.

All displayed correlations are positive and marked $p < .001$. PB correlates with CTA at .425, UHC at .482, HM at .512, and literacy at .388. CTA correlates with UHC at .410, HM at .455, and literacy at .362. UHC correlates with HM at .538 and literacy at .405. The literacy-HM correlation is .421. The strongest observed pair is UHC-HM, consistent with health-oriented engagement accompanying greater maintenance attribution, but the relationship remains moderate rather than indicating that the constructs are identical.

For the latent constructs, the diagonal square roots of revised AVE are .802 for PB, .773 for CTA, .810 for UHC, and .767 for HM. Each exceeds the corresponding observed pairwise correlations. These values are consistent with taking the square roots of .643, .598, .656, and .589 after rounding. The pattern supports the conventional comparison while leaving room for examination of overlapping wording and local measurement residuals.

The literacy diagonal is not applicable because no literacy AVE is estimated for the observed composite. Its correlations can be reported without inventing a factor-level loading, CR, or AVE. HTMT entries from the older matrix are omitted because the revised matrix supplies no replacement HTMT calculation. This is a consistent treatment of the predictor rather than a claim that a single aggregate has passed every possible discriminant-validity test.

The observed correlation matrix does not replace the structural model. Bivariate correlations ignore simultaneous antecedents, whereas model coefficients condition on the specified predictors and measurement arrangement. Observed score correlations can also differ from latent-factor correlations. The displayed matrix therefore cannot be used alone to reconstruct latent paths or explained variance. A complete model covariance matrix and parameter output would be necessary for independent reproduction of those quantities.

4.4 Direct associations

Table 4 presents the revised focal paths. PB is positively associated with UHC, $B = .312$, $SE = .045$, critical ratio = 6.933, $\beta = .285$, $p < .001$. CTA is positively associated with UHC, $B = .235$, $SE = .042$, critical ratio = 5.595, $\beta = .224$, $p < .001$. Literacy is also positively associated with UHC, $B = .294$, $SE = .048$, critical ratio = 6.125, $\beta = .248$, $p < .001$. The directions and significance support H1–H3 as hypotheses about conditional associations in the reported model.

Table 4

Focal structural paths

ID	Path	B	SE	β	CRatio	p	Result
H 1	PB to UHC	.312	.045	.285	6.933	< .001	Supported
H 2	CTA to UHC	.235	.042	.224	5.595	< .001	Supported
H 3	TCM -HL to UHC	.294	.048	.248	6.125	< .001	Supported
H 4	UHC to HM	.415	.038	.506	10.921	< .001	Supported

Note. B = unstandardized maximum likelihood coefficient; SE = standard error; β = standardized coefficient; CRatio = critical ratio B/SE. H1–H4 are limited to the focal paths documented in the retained results.

PB has the largest displayed standardized antecedent-use coefficient, followed by literacy and CTA. That ordering describes point estimates rather than an inferential difference between them. No pairwise coefficient test or bootstrap interval for their differences is available. Standardization also depends on the variability of measures in this sample. These results do not estimate the comparative returns from benefit communication, professional advice, and literacy education.

The UHC-HM path is positive, $B = .415$, $SE = .038$, critical ratio = 10.921, $\beta = .506$, $p < .001$, supporting H4. The result associates stronger health-oriented participation with stronger attributed maintenance, subject to the other terms in the specified outcome equation. The observed UHC-HM correlation is .538. The standardized structural coefficient and the observed correlation concern different quantities, so their numerical proximity is not evidence that measurement error or all alternative explanations have been removed.

4.5 Bootstrap indirect associations

Table 5 reports fully standardized indirect estimates with standardized bootstrap standard errors, bias-corrected 95% intervals, and the explicitly supplied two-tailed bootstrap p values. The PB-UHC-HM estimate is .144, Boot SE = .020, CI [.104, .184], $p = .001$. The CTA-UHC-HM estimate is .113, Boot SE = .018, CI [.076, .149], $p = .001$. The literacy-UHC-HM estimate is .126, Boot SE = .019, CI [.088, .164], $p = .001$. Each interval is positive and excludes zero, supporting the reported indirect-association tests for H5–H7.

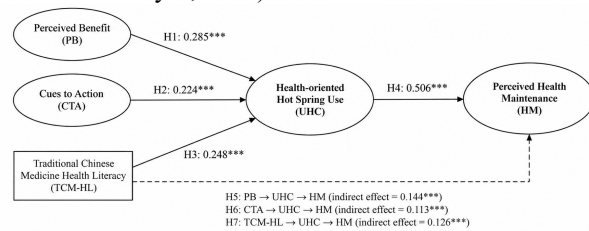
Table 5
Fully standardized bootstrap indirect associations

ID	Indirect path	β indirect	Boot SE	95% BC CI	Bootstrap p
H5	PB via UHC to HM	.144	.020	[.104, .184]	.001
H6	CTA via UHC to HM	.113	.018	[.076, .149]	.001
H7	TCM-HL via UHC to HM	.126	.019	[.088, .164]	.001

Note. Based on 5,000 resamples. BC = bias-corrected; CI = confidence interval. Point estimates, Boot SE, and limits are reported as fully standardized. The two-tailed bootstrap p value is .001 for each pathway. All intervals exclude zero, supporting the reported H5–H7 indirect-association tests.

The revised focal paths are compatible with these indirect points within the precision of the displayed coefficients. Their products are .14421, .113344, and .125488. Reporting .126 for literacy remains possible when unrounded component coefficients are used. Multiplying rounded table entries is a diagnostic arithmetic check, not a replacement for a bootstrap estimate generated from the underlying fit. The unstandardized coefficients produce products in different units and must not be substituted into the standardized column.

The explicitly reported $p = .001$ values resolve the earlier uncertainty about bootstrap significance. They are not changed to $p < .001$. In addition, the confidence intervals and standard errors are now identified as fully standardized in the accompanying analysis description. These clarifications improve reporting but do not establish temporal ordering or remove common measurement influences. Bootstrapping quantifies uncertainty within the estimated arrangement rather than verifying a causal mechanism (Maxwell & Cole, 2007; Preacher & Hayes, 2008).



Note. Standardized path coefficients are reported. The indirect effects are bias-corrected bootstrap estimates (5,000 resamples). *** $p < 0.001$.

Figure 2. Structural model for perceived health maintenance

As shown in Figure 2, all hypothesized direct and indirect associations were supported. Perceived benefit (PB; $\beta = .285$, $p < .001$), cues to action (CTA; $\beta = .224$, $p < .001$), and traditional Chinese medicine health literacy (TCM-HL; $\beta = .248$, $p < .001$) were positively

associated with health-oriented hot spring use (UHC), supporting H1–H3. In turn, UHC was positively associated with perceived health maintenance (HM; $\beta = .506$, $p < .001$), supporting H4. The bootstrap analysis further showed significant positive indirect associations of PB ($\beta = .144$), CTA ($\beta = .113$), and TCM-HL ($\beta = .126$) with HM through UHC, with all bias-corrected 95% confidence intervals excluding zero, thereby supporting H5–H7. Overall, the structural results indicate that health-oriented hot spring use serves as the central intervening construct linking supportive health beliefs and TCM-related information capability with perceived health maintenance.

5 Discussion

5.1 Supportive beliefs and perceived professional guidance

The reported results support a focused relationship between positive health-belief components and health-oriented participation. Perceived benefit and cues to action both retain positive associations with use when literacy is included. This pattern is consistent with the behavioral relevance of benefits identified by the health-belief meta-analysis (Carpenter, 2010) and with the model's application to complementary medicine decisions (Tehrani et al., 2022). The present context extends that reasoning to a voluntary service that combines recreation and self-care. It does not show that the entire health belief model has been validated or that benefit beliefs outweigh omitted threats and barriers.

The benefit association is especially informative because its items describe service support rather than personal therapeutic efficacy. Users who regard facilities, resources, and opportunities favorably also report stronger health-oriented engagement. This connects the service-system perspective in wellness tourism (Dini & Pencarelli, 2022) with a selective health-belief account. It suggests that evaluating bathing as supportive practice involves how the service environment enables participation, not only an expectation about a specific bodily outcome. However, the substantial adaptation from residents' development evaluations limits any claim of equivalence to a conventional benefit-belief scale (L. Li et al., 2025).

The cue association is consistent with the activating role of communication discussed in health-belief research (Jones et al., 2015). In this sample, perceived professional encouragement accompanies participation even after favorable benefit appraisal is considered. The finding should be interpreted at the level measured: respondents' perceptions of professional emphasis and support. It does not demonstrate that professionals personally advised each respondent, that a recommendation was medically appropriate, or that advice caused participation. Distinguishing perceived legitimacy from documented recommendation is necessary for a credible practical interpretation.

PB has a somewhat larger reported use coefficient than CTA, but the difference should not be turned into an

effectiveness ranking. Communication interventions, service improvements, and literacy programs operate on different mechanisms and timescales. The observational coefficients quantify conditional relationships among measures, not the return from investing in one intervention rather than another. A future study comparing changes in service appraisal and actual advice would need an explicit design and an inferential comparison of their effects.

5.2 Information capability within culturally relevant participation

TCM literacy retains a positive reported association with use alongside PB and CTA. At a theoretical level, this pattern is compatible with information capability supplying explanatory content beyond favorable evaluation and perceived encouragement. General literacy research links capability with health-related action (Nutbeam, 2000; Sørensen et al., 2012), while recent self-care reviews establish its relevance in chronic illness (Magi et al., 2026). The hot spring result extends the question to users of a voluntary wellness service. Its contribution lies in the distinction among the measured roles, rather than the proposition that every kind of information increases consumption.

This interpretation rests on information-related item content. The reported measure covers comprehension, retrieval, appraisal, application, and responsible use of information rather than a single favorable attitude. However, the domain allocation differs from the original source and requires documentation against the administered version. The TCM measurement review emphasizes the need to distinguish competence from endorsement (Qian et al., 2024). Work on cultural and conceptual knowledge similarly shows why recognizing familiar terminology need not establish understanding (Buki et al., 2024). The contribution is strongest when the local questionnaire transparently captures the information capability claimed by its label.

The result also speaks to the coexistence of medical traditions. Chinese studies of dual literacy and rural older adults show why capability should be situated within a specific population and information environment (Mi et al., 2025; H. Zhang et al., 2024). In the current user sample, culturally relevant knowledge can help interpret the supportive role assigned to bathing. The model does not test whether TCM literacy is superior to general or modern-medical literacy, because those alternative measures are absent. It also does not establish that facilities deliver TCM treatment or that users make decisions exclusively within a traditional medical framework.

Evidence on literacy and complementary practices varies across contexts (Dehghan et al., 2023; Tek Ayaz, 2023). This variation helps explain why the positive H3 should be considered a contextual relationship rather than a universal prediction. Participants have already used hot springs, and a more capable user can engage selectively within that experience. Among nonusers,

critical appraisal could instead support refusal, alternative activities, or a request for clearer evidence. Education should consequently be evaluated by the quality of decisions it supports, not by whether it always produces more visits.

5.3 Engagement and attributed maintenance

The positive use-maintenance path suggests that people reporting stronger health-oriented engagement also attribute greater maintenance support to bathing. This is compatible with wellness research describing multidimensional perceived benefits (Liao et al., 2023) and with work examining restorative destination environments (Jeong, 2024). Participation can provide a routine and an experience around which users organize self-care meanings. The present measures support this experiential interpretation, while leaving the respective roles of relaxation, bodily response, social experience, and expectation unresolved.

The three reported indirect associations identify a common engagement connection in the theoretical account. Their positive confidence intervals are compatible with benefit appraisal, perceived professional support, and literacy each relating to maintenance through use. Because matching direct antecedent-to-maintenance estimates from the same fitted model are not reported, the findings are described as indirect associations rather than classified as partial or complete mediation.

That statistical pattern remains observational. Cross-sectional mediation can distort processes unfolding over time (Maxwell & Cole, 2007), and a favorable maintenance perception can motivate later use or reinforce benefit appraisal. Simultaneous measurement of literacy, beliefs, use, and maintenance removes no such reverse-order explanation. Resampling cannot resolve it, because bootstrap intervals describe uncertainty in an estimated covariance arrangement rather than establish temporal precedence (Preacher & Hayes, 2008). The language of indirect association is therefore central to the discussion.

Clinical evidence provides a separate boundary. Reviews of balneotherapy evaluate specified outcomes among defined patient groups (García-López et al., 2024; Mao et al., 2023; Protano et al., 2023), and a broader review reports very low certainty for important rheumatological evidence (Aribi et al., 2025). The current survey should not be used to resolve those clinical questions. A favorable maintenance rating is evidence about attribution and experience, not proof of disease prevention, rehabilitation success, or objective recovery. This distinction allows the behavioral findings to remain useful without placing them in competition with a type of evidence the study does not produce.

A service interpretation also benefits from distinguishing destination management from users' attributed outcomes. Community health-tourism research in Nan Province describes the role of local participation and health-tourism networks (Jetjiro,

2021). That evidence concerns an organizational and community setting, whereas the present unit of analysis is the individual user. The comparison suggests that information quality and participation opportunities should be understood within the service environment that makes them available. It does not establish that the networks observed in Thailand characterize the Chinese recruitment settings or that community participation has been measured here.

Psychological restoration deserves the same careful separation. A review of workplace stress discusses pressures affecting well-being and the need for stress-management responses (Latthasaksiri, 2021). It supports treating psychological demands as relevant background for wellness participation, but it does not test hot spring bathing. The present maintenance construct can capture attributed psychological support alongside other forms of self-care meaning; no separate stress outcome or work-related recovery variable is added. This boundary permits a focused discussion without converting a contextual literature into evidence for an unmeasured treatment effect.

5.4 Theoretical contribution and scope

The first contribution is a focused account in which supportive service evaluation, perceived professional prompting, and information capability have distinct explanatory roles. The reported coefficients are compatible with that differentiation because each antecedent relates to use in the same equation. Nevertheless, a complete incremental-validity claim would require comparing a belief-only model with a model adding literacy and documenting the change in explained variance or fit. A significant literacy path alone is insufficient to quantify how much explanatory improvement literacy contributes beyond the baseline model.

The second contribution is to place culturally relevant literacy within an account of health-oriented service participation without treating cultural familiarity as endorsement. TCM perspective research and population studies establish the importance of this information setting (Y. Li et al., 2022; Qian et al., 2023; X. Zhang et al., 2024). The present framework specifies where capability belongs: alongside motivational appraisal and perceived prompting, with engagement linking these antecedents to subjective maintenance. This placement gives a testable role to literacy rather than using it as a general background description.

The third contribution is an outcome boundary. The study preserves health maintenance as the dependent construct while making its subjective and attributed character explicit. Wellness and clinical literatures can therefore inform interpretation without being merged into a single claim of therapeutic efficacy (Bender et al., 2026; Chen & Petrick, 2013; Cohen et al., 2017). The reported new knowledge is that a capability-informed configuration accompanies health-oriented bathing and perceived maintenance among users, subject to a

consistent measurement specification. It is not a claim that literacy causes medical benefit or that the focused model supersedes broader health-belief explanations.

5.5 Practical implications

The findings support attention to information quality alongside service appeal. Providers can explain the supportive purpose of an activity, distinguish leisure participation from supervised treatment, and describe the limits of the claims they make. Benefit communication should reflect the facilities and opportunities actually available rather than convert a positive perception coefficient into a promise of clinical recovery. The association between appraisal and use gives a reason to make service descriptions accurate and understandable, not a justification for amplifying unverified claims.

Professional guidance should be accessible and clearly identified. Since the cue scale measures perceived encouragement, a provider should distinguish qualified information from promotional language that merely borrows professional authority. Visitors need to understand who supplied a recommendation, what setting it applies to, and how it relates to their existing care. The survey does not test specific clinical participation advice, so operational decisions about individual suitability require qualified assessment rather than interpretation of structural coefficients.

Literacy-oriented communication should support appraisal. Information can explain terminology, evidence quality, the relation between traditional and modern medical ideas, and the difference between supportive experience and established treatment outcomes. The social-determinant perspective also emphasizes that capability depends on accessible services and communication, not simply on a person's willingness to learn (Nutbeam & Lloyd, 2021). A program that enables a visitor to decline an unsuitable service can be successful even if it does not increase consumption.

The sample's age and education diversity suggests that communication should accommodate different information needs, but the study provides no tested subgroup differences. Providers should therefore avoid using these tables to assign presumed preferences or literacy levels to age categories. Future evaluation can examine comprehension and decision quality across groups, with measurement comparability established before structural comparisons (Putnick & Bornstein, 2016). Improvements should be assessed using actual understanding and experience rather than purchase frequency alone.

5.6 Limitations and future research

The first limitation concerns sample selection. Online participation and previous bathing experience define a user group that can differ from nonusers and adults with limited digital access. The education distribution reinforces this issue. Regional settings broaden the study context but do not establish national

representativeness. The final sample count does not supply a recruitment denominator or a complete record of exclusions. Future replication should document the participant flow and location allocations and consider a frame that includes those who decline or cannot access the service.

The second limitation concerns measurement. The retained scales use substantial contextual adaptations, and several statements share favorable health language. Loadings and reliability do not substitute for content and response-process validation (Boateng et al., 2018; McNeish, 2018). PB concerns service support, CTA perceived encouragement, and HM attributed maintenance. The literacy composite combines a broad information domain, and its domain allocation differs from the cited original instrument. Its observed treatment does not separately estimate its measurement error. These features constrain a claim that capability has been isolated perfectly from favorable appraisal.

The third limitation concerns timing and shared reporting. All measures were administered in the same cross-sectional wave, so an antecedent-engagement-outcome chronology is not observed. Shared method influences remain possible, and a poorly fitting single-factor model does not eliminate them (Podsakoff et al., 2024). Prospective studies should separate baseline appraisal and capability from subsequent participation and later outcomes. Independently recorded service use and maintenance measures that do not explicitly attribute improvement to bathing would also reduce reliance on consistent retrospective attribution.

The fourth limitation concerns reproducibility of the complete model. The retained manuscript reports the focal direct paths and standardized bootstrap indirect associations that can be documented consistently. Global structural fit, explained variance, and additional direct antecedent-to-maintenance paths are not reported because matching output from the same fitted specification is not available. Independent replication should retain the respondent-level dataset, questionnaire, model specification, and complete software output.

Future measurement work should determine whether a broad TCM information-literacy scale captures decisions about ordinary bathing or whether a carefully validated context-specific measure is necessary (Qian et al., 2024; R. Zhang et al., 2019). Prospective replication should include users and nonusers, document actual exposure, and distinguish enjoyment, self-care orientation, and clinical endpoints. Intervention research can then assess whether clearer communication improves informed choice and appropriate participation. Such designs would test the proposed mechanism directly rather than infer it from a significant cross-sectional product.

6 Conclusion

The study examines a focused account of health-oriented hot spring participation while retaining

perceived health maintenance as the final outcome. Perceived benefit, cues to action, and TCM health literacy show positive associations with use in the revised focal results, and use is positively associated with maintenance. The bootstrap summary reports positive standardized indirect associations connecting each antecedent with maintenance through engagement. These results address the research questions at the level of reported cross-sectional relationships. The substantive contribution is the distinction among supportive appraisal, perceived professional encouragement, and information capability within one behavioral account. It connects culturally relevant literacy with engagement rather than treating it as awareness or endorsement. The evidence remains specific to respondents' reported participation and maintenance attribution. It does not demonstrate clinical improvement, establish causal mediation, or show that literacy should increase every form of service use. The information-capability perspective encourages research on informed participation rather than the maximization of consumption. Providers can make the supportive role of their services understandable, distinguish professional advice from promotional authority, and help visitors appraise culturally relevant claims. A decision to participate, participate selectively, or decline should be evaluated in relation to understanding and suitability. Future studies should establish temporal ordering, reproduce the complete measurement and structural specification, and connect reported experience with independently assessed use and health outcomes.

Author Contributions

Xiaoyi Xu: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, and Writing – Original Draft.

Songyu Jiang: Conceptualization, Methodology, Supervision, Validation, Writing – Review & Editing, and Project Administration.

Jirawan Deeprasert: Supervision, Validation, Writing – Review & Editing, and Academic Guidance.

All authors reviewed and approved the final version of the manuscript and agreed to be accountable for the work.

Conflict of Interest

The authors declare that they have no known financial or non-financial competing interests that could have influenced the research reported in this article.

Acknowledgments

The authors gratefully acknowledge the academic support provided by the Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR), Thailand. The authors appreciate the College's support in facilitating the academic development and completion of this research.

References

- Aribi, I., Nourredine, M., Giroudon, C., Massy, E., Lega, J.-C., Kassai, B., & Grenet, G. (2025). Efficacy and safety of balneotherapy in rheumatology: A systematic review and meta-analysis. *BMJ Open*, 15(2), Article e089597. <https://doi.org/10.1136/bmjopen-2024-089597>
- Bender, T., Hodosi, K., & Tefner, I. K. (2026). Evidence-based balneotherapy in Hungary. Updated systematic review and meta-analysis of the Hungarian clinical trials. *International Journal of Biometeorology*, 70(3), Article 78. <https://doi.org/10.1007/s00484-025-03102-3>
- Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine*, 155(2), 97–107. <https://doi.org/10.7326/0003-4819-155-2-201107190-00005>
- Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quinonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health*, 6, Article 149. <https://doi.org/10.3389/fpubh.2018.00149>
- Buki, L. P., Quintero Johnson, J. M., Knight, K., & Walton, A. (2024). “Cultural and conceptual knowledge”: Reformulation and conceptual analysis of a key component of the health literacy model. *Social Science & Medicine*, 356, Article 117150. <https://doi.org/10.1016/j.socscimed.2024.117150>
- Butayeva, J., Ratan, Z. A., Downie, S., & Hosseinzadeh, H. (2023). The impact of health literacy interventions on glycemic control and self-management outcomes among type 2 diabetes mellitus: A systematic review. *Journal of Diabetes*, 15(9), 724–735. <https://doi.org/10.1111/1753-0407.13436>
- Carpenter, C. J. (2010). A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Communication*, 25(8), 661–669. <https://doi.org/10.1080/10410236.2010.521906>
- Chen, C.-C., & Petrick, J. F. (2013). Health and wellness benefits of travel experiences: A literature review. *Journal of Travel Research*, 52(6), 709–719. <https://doi.org/10.1177/0047287513496477>
- Cohen, M. M., Elliott, F., Oates, L., Schembri, A., & Mantri, N. (2017). Do wellness tourists get well? An observational study of multiple dimensions of health and well-being after a week-long retreat. *The Journal of Alternative and Complementary Medicine*, 23(2), 140–148. <https://doi.org/10.1089/acm.2016.0268>
- Dehghan, M., Rad, M. M., Lari, L. A., Ghorbani-nejad, B., & Mohebi-Rad, M. (2023). The relationship between use of complementary and alternative medicine and health literacy in chronically ill outpatient cases: A cross-sectional study in southeastern Iran. *Frontiers in Public Health*, 11, Article 988388. <https://doi.org/10.3389/fpubh.2023.988388>
- Dini, M., & Pencarelli, T. (2022). Wellness tourism and the components of its offer system: A holistic perspective. *Tourism Review*, 77(2), 394–412. <https://doi.org/10.1108/tr-08-2020-0373>
- Flora, D. B. (2020). Your coefficient alpha is probably wrong, but which coefficient omega is right? A tutorial on using R to obtain better reliability estimates. *Advances in Methods and Practices in Psychological Science*, 3(4), 484–501. <https://doi.org/10.1177/2515245920951747>
- García-López, H., García-Giménez, M. T., Obrero-Gaitán, E., Lara-Palomo, I. C., Castro-Sánchez, A. M., Rey, R. R.-D., & Cortés-Pérez, I. (2024). Effectiveness of balneotherapy in reducing pain, disability, and depression in patients with fibromyalgia syndrome: A systematic review with meta-analysis. *International Journal of Biometeorology*, 68(10), 1935–1951. <https://doi.org/10.1007/s00484-024-02732-3>
- Haghighy, S., Khoshnevis, S., Smolensky, M. H., Diller, K. R., & Castriotta, R. J. (2019). Before-bedtime passive body heating by warm shower or bath to improve sleep: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 46, 124–135. <https://doi.org/10.1016/j.smrv.2019.04.008>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>

- Huang, L., Yang, W., Yang, J., Jing, P., Ye, Y., Zhao, Y., Lyu, C., Kong, X., Wang, L., Wang, P., Lin, Y., Chen, R., Yao, Y., & Li, Y. (2025). Development and validation of assistance needs assessment scale of the home-dwelling older adults. *BMC Geriatrics*, 25(1), Article 822. <https://doi.org/10.1186/s12877-025-06539-8>
- Jeong, H. (2024). Relationship between tourists' perceived restorative environment and wellness tourism destinations. *International Journal of Tourism Research*, 26(5), Article e2765. <https://doi.org/10.1002/jtr.2765>
- Jetjiraj, P. (2021). Sustainable enterprise of community health tourism in Nan Province after COVID-19. *RICE Journal of Creative Entrepreneurship and Management*, 2(1), 13–21. <https://doi.org/10.14456/rjcm.2021.20>
- Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The health belief model as an explanatory framework in communication research: Exploring parallel, serial, and moderated mediation. *Health Communication*, 30(6), 566–576. <https://doi.org/10.1080/10410236.2013.873363>
- Lakens, D. (2022). Sample size justification. *Collabra: Psychology*, 8(1), Article 33267. <https://doi.org/10.1525/collabra.33267>
- Latthasaksiri, N. (2021). Stress management at workplace in challenging situations. *RICE Journal of Creative Entrepreneurship and Management*, 2(3), 31–38. <https://doi.org/10.14456/rjcm.2021.31>
- Li, L., Wang, D., & Li, Q. (2025). Research on influencing factors of tourism support behavior of residents in health and wellness tourism destination: The moderating role of active health. *Sustainability*, 17(10), Article 4507. <https://doi.org/10.3390/su17104507>
- Li, Y., Lv, X., Liang, J., Dong, H., & Chen, C. (2022). The development and progress of health literacy in China. *Frontiers in Public Health*, 10, Article 1034907. <https://doi.org/10.3389/fpubh.2022.1034907>
- Liao, C., Zuo, Y., Xu, S., Law, R., & Zhang, M. (2023). Dimensions of the health benefits of wellness tourism: A review. *Frontiers in Psychology*, 13, Article 1071578. <https://doi.org/10.3389/fpsyg.2022.1071578>
- Limkunakul, C., Phuthomdee, S., Srinithiwat, P., Chanthanaroj, S., Boonsawat, W., & Sawanyawisuth, K. (2022). Factors associated with preventive behaviors for COVID-19 infection among healthcare workers by a health behavior model. *Tropical Medicine and Health*, 50(1), Article 65. <https://doi.org/10.1186/s41182-022-00454-z>
- Magi, C. E., El Aoufy, K., Amato, C., Longobucco, Y., Bambi, S., Vellone, E., Bonaccorsi, G., Lorini, C., Rasero, L., & Iovino, P. (2026). The association between self-care and health literacy in patients with chronic diseases: A systematic review and meta-analysis. *Journal of Clinical Nursing*, 35(7), 3011–3029. <https://doi.org/10.1111/jocn.70291>
- Mao, S., Xiao, K., Zhou, W., Xu, H., & Zhang, S. (2023). The impact of hot spring hydrotherapy on pain perception and dysfunction severity in patients with chronic low back pain: A systematic review and meta-analysis. *Journal of Pain Research*, 16, 3925–3944. <https://doi.org/10.2147/jpr.s438744>
- Martins, P., Neves de Jesus, S., Pocinho, M., & Pinto, P. (2025). Wellness tourism: A systematic literature review. *International Journal of Spa and Wellness*, 8(2), 215–245. <https://doi.org/10.1080/24721735.2025.2467608>
- Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, 12(1), 23–44. <https://doi.org/10.1037/1082-989x.12.1.23>
- McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods*, 23(3), 412–433. <https://doi.org/10.1037/met0000144>
- Mi, F., Zhou, W., Wang, L., Yuan, F., Qian, M., Zhang, H., & Xu, N. (2025). Status and influencing factors of dual health literacy in modern medicine and traditional Chinese medicine among Chinese residents. *Frontiers in Public Health*, 13, Article 1525282. <https://doi.org/10.3389/fpubh.2025.1525282>
- Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, 15(3), 259–267. <https://doi.org/10.1093/heapro/15.3.259>
- Nutbeam, D., & Lloyd, J. E. (2021). Understanding and responding to health literacy as a social determinant of health. *Annual Review of Public Health*, 42(1), 159–173. <https://doi.org/10.1146/annurev-publhealth-090419-102529>
- Phakdeephiront, N. (2021). Tourists' satisfaction with products, services and quality development of hot spring wellness tourism. *RICE Journal of Creative Entrepreneurship and Management*, 2(3), 1–22. <https://doi.org/10.14456/rjcm.2021.34>

- Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior*, 11(1), 17–61. <https://doi.org/10.1146/annurev-orgpsych-110721-040030>
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. <https://doi.org/10.3758/brm.40.3.879>
- Protano, C., Fontana, M., De Giorgi, A., Marotta, D., Cocomello, N., Crucianelli, S., Del Cimmuto, A., & Vitali, M. (2023). Balneotherapy for osteoarthritis: A systematic review. *Rheumatology International*, 43(9), 1597–1610. <https://doi.org/10.1007/s00296-023-05358-7>
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41, 71–90. <https://doi.org/10.1016/j.dr.2016.06.004>
- Qian, Z., Wang, G. Y., Henning, M., & Chen, Y. (2023). Understanding health literacy from a traditional Chinese medicine perspective. *Journal of Integrative Medicine*, 21(3), 215–220. <https://doi.org/10.1016/j.joim.2023.03.001>
- Qian, Z., Wang, G. Y., Henning, M., & Chen, Y. (2024). Measurements of traditional Chinese medicine health literacy regarding chronic pain: A scoping review. *BMC Complementary Medicine and Therapies*, 24(1), Article 395. <https://doi.org/10.1186/s12906-024-04698-6>
- Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly*, 15(2), 175–183. <https://doi.org/10.1177/109019818801500203>
- Schoemann, A. M., Boulton, A. J., & Short, S. D. (2017). Determining power and sample size for simple and complex mediation models. *Social Psychological and Personality Science*, 8(4), 379–386. <https://doi.org/10.1177/1948550617715068>
- Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H., & (HLS-EU) Consortium Health Literacy Project European. (2012). Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health*, 12(1), Article 80. <https://doi.org/10.1186/1471-2458-12-80>
- Tehrani, H., Dadashi, N., Movahedzadeh, D., Khorasani, E. C., & Jafari, A. (2022). The predictors of the use of complementary and alternative medicine among type 2 diabetes patients based on the health belief model. *Journal of Diabetes & Metabolic Disorders*, 21(1), 285–292. <https://doi.org/10.1007/s40200-022-00971-y>
- Tek Ayaz, S. (2023). The roles of health literacy in parents' honey use and the use of complementary alternative medicine in a Turkish population. *BMC Complementary Medicine and Therapies*, 23(1), Article 376. <https://doi.org/10.1186/s12906-023-04209-z>
- Thotongkam, W., Champahom, T., Nilplub, C., Wimitisuksuntorn, W., Jomnonkwao, S., & Ratanavaraha, V. (2023). Influencing travelers' behavior in Thailand comparing situations of during and post COVID-19. *Sustainability*, 15(15), Article 11772. <https://doi.org/10.3390/su151511772>
- Ukai, T., Iso, H., Yamagishi, K., Saito, I., Kokubo, Y., Yatsuya, H., Muraki, I., Eshak, E. S., Sawada, N., & Tsugane, S. (2020). Habitual tub bathing and risks of incident coronary heart disease and stroke. *Heart*, 106(10), 732–737. <https://doi.org/10.1136/heartjnl-2019-315752>
- Voigt, C., Brown, G., & Howat, G. (2011). Wellness tourists: In search of transformation. *Tourism Review*, 66(1/2), 16–30. <https://doi.org/10.1108/16605371111127206>
- Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, 73(6), 913–934. <https://doi.org/10.1177/0013164413495237>
- Zhang, H., Zhang, Y., Yan, Y., Li, X., & Tian, Y. (2024). Traditional Chinese medicine health literacy among rural older adults: A cross-sectional study. *Frontiers in Public Health*, 12, Article 1361572. <https://doi.org/10.3389/fpubh.2024.1361572>
- Zhang, R., Fei, C., & Xia, H. (2019). Zhongyi yangsheng jiankang xinxi suyang liangbiao bianzhi ji qi xin xiaodu jianyan [Development and psychometric evaluation of health information literacy scale in traditional Chinese medicine]. *Zhongguo Quanke Yixue*, 22(12), 1461–1467. <https://doi.org/10.12114/j.issn.1007-9572.2018.00.419>

Zhang, X., Hong, X., & Zhang, Z. (2024). The mediating effect of traditional Chinese medicine (TCM) health literacy between tcm culture promotion and residents' health status. *Frontiers in Public Health*, 12, Article 1386085.
<https://doi.org/10.3389/fpubh.2024.1386085>

Appendix A Retained questionnaire wording

The following 18 English statements reproduce the retained questionnaire wording. Their substantial contextual adaptations and their narrower construct meanings are discussed in Section 3.3. TCM literacy is measured through a separate 36-item instrument described in Section 3.4; its item wording is not reconstructed here. The administered form and domain allocation should accompany the study record.

Perceived benefit

PB1. The availability of hot spring-based complementary and alternative medicine services improves the quality of healthcare-related facilities and service environments that support health management.

PB2. The development of hot spring-based complementary and alternative medicine services increases opportunities to participate in health-related therapeutic and preventive activities.

PB3. The expansion of hot spring-based complementary and alternative medicine services promotes the availability of healthcare-related resources that individuals can benefit from.

PB4. The development of hot spring-based complementary and alternative medicine services creates supportive healthcare environments that benefit individuals' physical and psychological well-being.

Cues to action

CTA1. I think that medical professionals emphasize the importance of maintaining health and safety through appropriate health management practices.

CTA2. I think that medical professionals encourage individuals to adopt complementary and alternative medical practices for health management.

CTA3. I think that advice from medical professionals increases my confidence in using complementary and alternative medical approaches such as hot spring therapy.

CTA4. I think that guidance provided by medical professionals helps me manage potential health risks more effectively.

Health oriented hot spring use

UHC1. I regularly use hot spring therapy as a complementary and alternative medical practice as part of my routine health maintenance and physical recovery activities.

UHC2. I use hot spring bathing as a form of bodily cleansing and relaxation to support physical recovery and health maintenance.

UHC3. I choose hot spring therapy as a complementary and alternative medical option to manage health risks

rather than relying solely on other leisure or lifestyle activities.

UHC4. I regularly use hot spring therapy as a preventive complementary and alternative medical practice to maintain physical balance and overall health.

Perceived health maintenance

HM1. Using hot spring therapy helps me maintain my physical health condition on a regular basis.

HM2. Using hot spring therapy helps me manage my health more effectively in my daily life.

HM3. Using hot spring therapy helps me maintain physical stability and reduce the risk of health deterioration.

HM4. Using hot spring therapy helps me sustain better day-to-day functioning and health-related self-care.

HM5. Using hot spring therapy helps me maintain a more stable state of physical and psychological recovery.

HM6. Using hot spring therapy supports my longer-term functional recovery and health maintenance.