

## HOT SPRING THERAPY IN JAPAN: MENTAL AND PHYSICAL HEALTH BENEFITS BY AGE AND GENDER

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### Abstract

Hot spring therapy is a longstanding cultural practice in Japan and is increasingly recognized as an important component of health tourism and regional revitalization. The aim of this study is to clarify the purposes of hot spring travel and to examine the associated mental and physical health benefits, with particular attention to differences by age and gender. Specifically, this study seeks to identify demographic patterns in travel motivations and perceived health outcomes among hot spring visitors using large-scale nationwide data. Using data from a nationwide cross-sectional survey commissioned by the Ministry of the Environment of Japan, responses were collected from 18,620 hot spring visitors aged 20 years and older between August 2018 and October 2022. After excluding incomplete responses, 15,608 valid questionnaires were analyzed. Travel motivations, purposes of hot spring use, and self-reported changes in health status were examined using cross-tabulation, chi-square tests, and correspondence analysis. The results show that hot springs were the primary purpose of travel across all age groups, followed by hobbies, refreshment, and fatigue recovery. Clear gender differences were observed: women were more likely to travel for beauty, refreshment, and health-related purposes, whereas men more frequently traveled for sightseeing, sports, and work. Age-based trends indicated that older adults prioritized health management and illness recovery, while younger individuals tended to travel for work or exploratory purposes. Participants reported overall improvements in mental and physical health following hot spring travel, particularly in happiness, sleep quality, fatigue reduction, and stress relief. Women reported significantly stronger perceived health benefits than men, especially improvements in cold sensitivity, skin condition, and swelling, while men more commonly reported improvements in general health and appetite. The novelty of this study lies in its use of a large, nationwide dataset combined with correspondence analysis to simultaneously visualize and interpret age- and gender-specific patterns in both travel purposes and perceived health effects of hot spring tourism. These findings provide empirical evidence to support the development of targeted, demographic-specific health tourism strategies. A limitation of this study is its reliance on subjective health assessments, suggesting the need for future research incorporating objective physiological measures.

**Keywords:** Hot Spring Therapy, Behavioral Analysis, Health Status.

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### 1. INTRODUCTION

Japan, rich in hot spring resorts, has a long history of hot spring therapy, forming a unique bathhouse culture. In contemporary times, regional revitalization combined with tourism is being promoted alongside hot spring therapy.

Medical tourism, estimated to be based on economics, healthcare, and tourism, is generally considered to contribute to health maintenance and recovery, leaving a positive impression on tourists. According to Bookman and Bookman (Bookman, Milica Z., and Karla R. Bookman (2007), medical tourism is not simply travel for health promotion but a sector of trade services resulting from the combination of tourism and healthcare. Medical tourism has been generated internationally by the flow of tourists (Larisa-Florenta, I. L. E., (2021) [1].

Visiting hot spring resorts has become part of tourism service packages, including hot spring therapy, accommodations, dining services, and optional tours.

Recognizing the significant economic effects of such travel, national strategies and policies have been adopted to promote such forms of tourism, resulting in new hot spring therapies. In July 2017, the Ministry of the Environment presented the "New Bath Therapy" promotion as a basic concept for future efforts to revitalize hot spring areas. The proposal, called the "New Bath Therapy Promotion Plan," aims to enhance the enjoyment of hot springs in line with modern lifestyles, summarizing necessary actions for hot spring resorts, local governments, and the Ministry of the Environment. To increase the value of staying in hot spring resorts, improving scientific data is essential. Consequently, a nationwide survey was conducted to scientifically grasp the therapeutic effects of hot springs across Japan using a unified questionnaire (Hayasaka, Shinya (2022)). The survey results indicated (1) positive changes in mental and physical states after staying at hot spring resorts, (2) better mental and physical changes related to engaging in activities rather than just soaking in hot water, and (3) beneficial effects on mental and physical health even with day travel or one-night stays. While hot spring therapy is widely known for its specialization in treating patients suffering from various diseases, tourism is based on motivations to achieve comfortable experiences. There is a phenomenon where people indicate preferences and needs for receiving hot spring therapy in a relaxing tourism environment. The rapid development of hot spring tourism presents an opportunity to study this phenomenon, considering its socio-economic impacts and the need to reorganize tourism activities emphasized by new forms and modern concepts (Lee, Cheng-Fei (2006) [2]. Research related to hot spring tourism is limited, generally targeting travel for hot spring therapy or interventions. This study, based on extensive data from the Ministry of the Environment, aims to clarify the purposes (including those beyond hot spring therapy) and health status of hot spring visitors concerning interest and trends in hot spring therapy. This study shows that hot springs are the main reason for travel. Women are interested in beauty, refreshment, and health, while men focus on sightseeing and work. Older adults prioritize health management, and younger people prefer work and exploration. Women report more health benefits, including reduced cold sensitivity, better skin, and less swelling. Men see overall health and appetite improvements.

## 2. MATERIALS AND METHODS

### 2.1. Survey Implementation and Management

The data collection was conducted by the Japan Health and Research Institute under the commission of the Ministry of the Environment.

### 2.2. Survey Target

Hot spring visitors aged 20 and over. Data collection methods include: (i) collection at hot spring resorts or facilities nationwide that agreed to the survey, and (ii) online survey.

### 2.3. Survey Content

This study utilized the results of a survey conducted by the Ministry of the Environment at hot spring resorts nationwide. The survey was a cross-sectional study using self-administered questionnaires, with 18,620 responses collected. The survey aimed to investigate values, perceptions, and attitudes related to Japanese hot spring therapy tourists. Survey items included: (1) Main purposes of travel (multiple answers allowed). (2) Purposes of using hot springs (multiple answers allowed). (3) Subjective evaluation of changes in health status (3: strongly agree, 2: agree, 1: somewhat agree, 0: neutral, -1: somewhat disagree, -2: disagree, -3: strongly disagree). (4) Gender and age.

### 2.4. Survey Period

August 2018 to October 2022.

### 2.5. Analysis Method

Cross-tabulation by age and gender was conducted to observe the number of responses for each item. The survey followed a non-repetitive random sampling method, providing potential information about the target population by investigating a portion of the survey population. This method offers significant information about specific attitudes and behaviors of potential domestic tourists within a relatively short period, ensuring high accuracy and cost savings. Based on cross-tabulation, correspondence analysis was conducted to visualize and interpret categorical data showing relationships and patterns among survey responses.

Correspondence analysis (CA) is a multivariate analysis technique used to represent the dimensions of cross-tabulated data in a two-dimensional graphical format, facilitating the understanding of complex relationships among these dimensions. Through CA, it is possible to categorize tourists' responses and visually display prevailing trends and associations in a scatter plot format.

Cross-tabulation was applied as a descriptive statistical method to examine relationships among categorical variables such as age group, gender, travel purpose, and perceived health outcomes (Agresti (2019) [3]. Differences in response distributions were tested using chi-square tests of independence, which are appropriate for categorical survey data (McHugh (2013) [4].

Furthermore, correspondence analysis was employed to investigate and visualize complex associations among multiple categorical variables. Correspondence analysis is a well-established multivariate technique that represents contingency table data in a reduced dimensional space, facilitating interpretation of categorical relationships (Greenacre (2017) [5]. Analyses were performed using SPSS version 29.0 (IBM).

### 2.6. Sample Size

Determination of sample size, calculation of estimates, and theoretical accuracy depended on the level of homogeneity of the collected data, error probability, guaranteed result probability, data collection time

resources, and budget size. The minimum sample size (n) corresponding to the population (N), based on a confidence level of 95% ( $z=1.96$ ), was calculated as follows:

$$n = N \times z^2 \times p \times (1-p) / \{e^2(N-1) + z^2 \times p \times (1-p)\} \approx 1067$$

In this case, the population (N) in Japan was 120 million. The margin of error ( $\Delta$ ) was  $\pm 3\%$ , and  $p=0.5$  represented the advantageous case for the entire population, indicating the proportion of potential tourists. Considering the dynamic nature of tourists, the applied sample type represented those who responded to both in-person and online surveys. The obtained information demonstrated higher reliability. Due to financial and organizational constraints, increasing the sample size to reduce selection error was not feasible, resulting in a maximum allowable error of 3%.

### 2.7. Ethical Considerations and Procedures

The survey did not collect personally identifiable information from respondents. Prior to conducting the analysis, it was reviewed and approved by the Ethics Committee of the Japan Health and Research Institute (approved on May 10, 2024, No. 24).

## 3. RESULTS

Data were obtained from 15,608 valid responses (excluding those without age and gender information) out of 18,620 collected responses. This sample size was sufficiently large. Table 1 shows the attributes of the sample. The number of women respondents was higher than that of men, with the 60s being the most frequent age group for men and the 50s for women. The single respondent in their 100s was treated as an outlier and excluded from the analysis. Table 2 presents the results of the Levene test and t-test for age between genders, showing no significant difference in variance. The t-test ( $p<0.001$ ) indicated that the age of men respondents was significantly higher.

Table 1. Age, Gender, and the total number

| Age   | 1: Male | 2: Femail |
|-------|---------|-----------|
| 20s   | 537     | 636       |
| 30s   | 579     | 809       |
| 40s   | 1126    | 1344      |
| 50s   | 1586    | 2043      |
| 60s   | 1908    | 1883      |
| 70s   | 1370    | 1134      |
| 80s   | 322     | 293       |
| 90s   | 21      | 16        |
| 100s  | 1       | 0         |
| Total | 7450    | 8158      |

Table 2. the Levene test and t-test

|     |                             | Levene's Test for Equality of Variances |       | t-test for Equality of Means |         |              |             |
|-----|-----------------------------|-----------------------------------------|-------|------------------------------|---------|--------------|-------------|
|     |                             |                                         |       |                              |         | Significance |             |
|     |                             | F                                       | Sig.  | t                            | df      | One-Sided p  | Two-Sided p |
| Age | Equal variances assumed     | 3.388                                   | 0.066 | 9.286                        | 15606   | <.001        | <.001       |
|     | Equal variances not assumed |                                         |       | 9.279                        | 15429.6 | <.001        | <.001       |

### 3.1 Main Purposes of Travel and Hot Spring Usage

Table 3 shows the age-based aggregation of the main purposes of travel and hot spring usage (%). To eliminate the impact of the difference in response numbers by age group, the averages were not adjusted for the number of people in each age group. The highest percentage was for the purpose of hot springs at an average of 70%, followed by hobbies at 60%, refreshment at 46%, fatigue recovery at 29%, and disease treatment at 19%.

Table 3. Age-Based Aggregation of Main Purposes of Travel and Hot Spring

| Age               | 20s | 30s | 40s | 50s | 60s | 70s | 80s | 90s | Mean |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Hot Spring        | 61% | 67% | 68% | 66% | 69% | 73% | 78% | 81% | 70%  |
| Accommodation     | 11% | 14% | 11% | 10% | 10% | 9%  | 10% | 16% | 11%  |
| Sightseeing       | 26% | 17% | 13% | 13% | 14% | 14% | 10% | 8%  | 14%  |
| Sports            | 2%  | 2%  | 4%  | 2%  | 2%  | 2%  | 1%  | 0%  | 2%   |
| Shopping          | 1%  | 0%  | 1%  | 1%  | 1%  | 1%  | 1%  | 0%  | 1%   |
| Food/Drink        | 6%  | 7%  | 7%  | 6%  | 6%  | 5%  | 5%  | 5%  | 6%   |
| Festival/Event    | 1%  | 1%  | 1%  | 1%  | 0%  | 1%  | 0%  | 0%  | 1%   |
| Relatives/Friends | 3%  | 4%  | 3%  | 4%  | 4%  | 4%  | 4%  | 3%  | 4%   |
| Work              | 4%  | 3%  | 4%  | 4%  | 2%  | 1%  | 1%  | 0%  | 2%   |
| Illness           | 8%  | 8%  | 13% | 14% | 17% | 23% | 32% | 38% | 19%  |
| Neuralgia         | 4%  | 4%  | 6%  | 5%  | 4%  | 5%  | 7%  | 11% | 6%   |
| Convalescence     | 2%  | 2%  | 3%  | 4%  | 5%  | 7%  | 7%  | 3%  | 4%   |
| Fatigue           | 21% | 23% | 28% | 27% | 30% | 33% | 37% | 32% | 29%  |
| Refresh           | 49% | 57% | 58% | 58% | 50% | 38% | 32% | 30% | 46%  |
| Beauty            | 9%  | 9%  | 9%  | 8%  | 6%  | 5%  | 4%  | 3%  | 7%   |
| Hobby             | 58% | 57% | 58% | 59% | 63% | 61% | 59% | 62% | 60%  |
| Nothing           | 12% | 7%  | 5%  | 4%  | 3%  | 3%  | 3%  | 14% | 6%   |
| Others            | 6%  | 9%  | 9%  | 10% | 11% | 11% | 10% | 5%  | 9%   |

Table 4 shows the results of the chi-square test on the main purposes of travel and hot spring usage by gender. When the purposes were hot springs ( $p<0.001$ ), accommodation ( $p=0.003$ ), neuralgia improvement ( $p<0.001$ ), refreshment ( $p<0.001$ ), and beauty ( $p<0.001$ ), the frequency for women was significantly higher. This suggests that these activities are particularly attractive to women or that women highly value the benefits they derive from these activities. On the other hand, for purposes such as sightseeing ( $p=0.008$ ), sports ( $p<0.001$ ), work ( $p<0.001$ ), and no specific purpose ( $p<0.001$ ), the frequency for men was significantly higher. This reflects that men are more active in leisure or work-related travel or have a higher interest in these purposes. For no specific purpose, it is possible that men visit hot springs dependently following women.

Table 4. Chi-Square Analysis of Main Purposes of Travel and Hot Spring

|                   | Asymptotic Significance (2-sided)<br>p-value | Adjusted Residual<br>Male/Female |
|-------------------|----------------------------------------------|----------------------------------|
| Hot Spring        | <0.001**                                     | -6.6/6.6                         |
| Accommodation     | 0.003**                                      | -3.0/3.0                         |
| Sightseeing       | 0.008**                                      | 2.7/-2.7                         |
| Sports            | <0.001**                                     | 3.1/-3.1                         |
| Shopping          | 0.369                                        | -0.9/0.9                         |
| Food/Drink        | 0.428                                        | -0.8/0.8                         |
| Festival/Event    | 0.732                                        | 0.3/-0.3                         |
| Relatives/Friends | 0.524                                        | -0.6/0.6                         |
| Work              | <0.001**                                     | 9.9/-9.9                         |
| Illness           | 0.230                                        | 1.2/-1.2                         |
| Neuralgia         | <0.001**                                     | -4.0/4.0                         |
| Convalescence     | 0.018*                                       | -2.4/2.4                         |
| Fatigue           | 0.493                                        | 0.7/-0.7                         |
| Refresh           | <0.001**                                     | -10.3/10.3                       |
| Beauty            | <0.001**                                     | -17.7/17.7                       |
| Hobby             | 0.058                                        | -1.9/1.9                         |
| Nothing           | <0.001**                                     | 3.6/-3.6                         |
| Others            | 0.064                                        | -1.9/1.9                         |

Significance: &lt;0.01\*\*, &lt;0.05\*

Table 5 shows the dimension contributions of correspondence analysis, and Figure 1 shows the results of correspondence analysis of the main purposes of travel and hot spring usage. According to the scores of Dimension 1 shown in Table 5 and Figure 1, the higher the age (61, 62, 71, 72, 81, 82, 91, 92), the more likely they are to travel for recovery from illness or disease improvement (12 Convalescence: 0.942, 10 Illness: 0.935), while the younger they are, the more likely they are to travel for work or with no specific purpose (9 Work: -1.113, 17 Nothing: -0.968). Dimension 2 scores indicate that younger individuals are more likely to travel for work or with no specific purpose (9 Work: 1.720, 17 Nothing: 0.826), while women are more likely to travel for beauty purposes (15 Beauty: -1.380). The trend of travel purposes by age and gender is clearly revealed. Observing the direction from the center (0, 0) in Figure 1, men in their 30s, 40s, and 50s (31, 41, 51) are more directed to 9 Work the younger they are. And women in their 30s, 40s, and 50s (32, 42, 52) are directed to 15 Beauty.

In Figure 1, men and women in their 30s, 40s, and 50s (31, 32, 41, 42, 51, 52) are scattered near 2 Accommodation, 3 Sightseeing, 4 Sports, 6 Food/Drink, 7 Festival/Event, and 14 Refresh, and tend to aim for these activities. Men and women in their 60s (61, 62) are scattered near 1 Hot Spring, 8 Relatives/Friends, 11 Neuralgia, and 16 Hobby, and tend to aim for these activities. Women in their 70s, men and women in their 80s, and women in their 90s (72, 81, 82, 92) are scattered near 5 Shopping, 10 Illness, and 12 Convalescence, and tend to aim for these activities. Men in their 90s (91) are scattered near 13 Fatigue, and tend to aim for this activity.

Table 5. Dimension and Contribution (Main Purposes of Travel and Hot Spring)

| Index        | Mass  | Score in Dimension |        | Inertia | Contribution                     |                                  |       |       |
|--------------|-------|--------------------|--------|---------|----------------------------------|----------------------------------|-------|-------|
|              |       | 1                  | 2      |         | Of Point to Inertia of Dimension | Of Dimension to Inertia of Point | 1     | 2     |
| 1            | 0.231 | 0.111              | -0.013 | 0.001   | 0.019                            | 0                                | 0.681 | 0.006 |
| 2            | 0.035 | -0.19              | -0.093 | 0.001   | 0.009                            | 0.003                            | 0.32  | 0.056 |
| 3            | 0.049 | -0.428             | 0.412  | 0.004   | 0.062                            | 0.078                            | 0.38  | 0.257 |
| 4            | 0.008 | -0.367             | 0.501  | 0.001   | 0.007                            | 0.018                            | 0.142 | 0.194 |
| 5            | 0.003 | 0.625              | -0.227 | 0       | 0.008                            | 0.002                            | 0.468 | 0.045 |
| 6            | 0.021 | -0.328             | 0.009  | 0.001   | 0.015                            | 0                                | 0.597 | 0     |
| 7            | 0.002 | -0.394             | 0.146  | 0       | 0.002                            | 0                                | 0.268 | 0.027 |
| 8            | 0.014 | 0.021              | 0.031  | 0.001   | 0                                | 0.003                            | 0.005 | 0.003 |
| 9            | 0.009 | -1.113             | 1.72   | 0.006   | 0.074                            | 0.243                            | 0.291 | 0.508 |
| 10           | 0.053 | 0.935              | 0.183  | 0.007   | 0.316                            | 0.017                            | 0.924 | 0.026 |
| 11           | 0.016 | 0.046              | -0.345 | 0.001   | 0.015                            | 0.005                            | 0.215 | 0.005 |
| 12           | 0.014 | 0.942              | -0.204 | 0.002   | 0.087                            | 0.006                            | 0.874 | 0.03  |
| 13           | 0.096 | 0.322              | 0.099  | 0.003   | 0.022                            | 0.009                            | 0.88  | 0.061 |
| 14           | 0.173 | -0.352             | -0.186 | 0.005   | 0.146                            | 0.056                            | 0.671 | 0.137 |
| 15           | 0.025 | -0.608             | -1.38  | 0.007   | 0.062                            | 0.436                            | 0.195 | 0.732 |
| 16           | 0.202 | 0.034              | 0.063  | 0       | 0.002                            | 0.008                            | 0.111 | 0.283 |
| 17           | 0.016 | -0.968             | 0.826  | 0.005   | 0.103                            | 0.102                            | 0.484 | 0.257 |
| 18           | 0.033 | 0.296              | -0.131 | 0.001   | 0.02                             | 0.005                            | 0.468 | 0.067 |
| Active Total | 1     |                    |        | 0.042   | 1                                | 1                                |       |       |

a. Symmetrical normalization

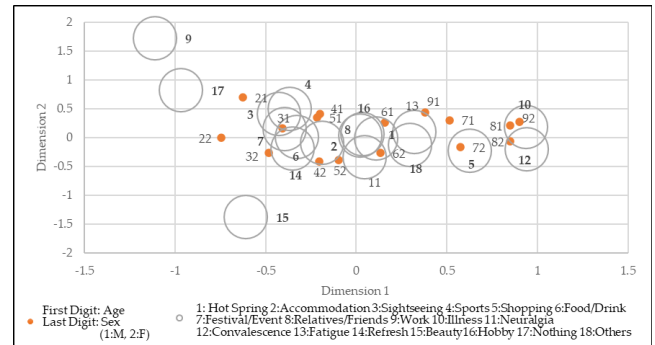


Figure 1. Correspondence Analysis (Main Purposes of Travel and Hot Spring)

### 3.2 Changes in Health Status

Table 6 shows the age-based aggregation of changes in subjective health status (Mean). The highest average score was for happiness at 1.75, followed by sleep improvement at 1.69, fatigue improvement at 1.63, stress improvement at 1.59, and health promotion at 1.57.

Table 6. Age-Based Average (Changes in Health Status)

| Age       | 20s  | 30s  | 40s  | 50s  | 60s  | 70s  | 80s  | 90s  | Mean |
|-----------|------|------|------|------|------|------|------|------|------|
| Healthy   | 1.76 | 1.60 | 1.63 | 1.55 | 1.37 | 1.41 | 1.56 | 1.70 | 1.57 |
| Happiness | 1.97 | 1.82 | 1.79 | 1.71 | 1.51 | 1.50 | 1.73 | 1.97 | 1.75 |
| Sleep     | 1.93 | 1.76 | 1.71 | 1.62 | 1.44 | 1.48 | 1.64 | 1.90 | 1.69 |
| Skin      | 1.76 | 1.68 | 1.69 | 1.57 | 1.38 | 1.37 | 1.33 | 1.40 | 1.52 |
| Appetite  | 1.45 | 1.33 | 1.38 | 1.34 | 1.27 | 1.25 | 1.27 | 1.67 | 1.37 |
| Stress    | 1.86 | 1.70 | 1.73 | 1.66 | 1.49 | 1.42 | 1.46 | 1.39 | 1.59 |
| Fatigue   | 1.88 | 1.68 | 1.71 | 1.63 | 1.46 | 1.43 | 1.56 | 1.71 | 1.63 |
| Cold      | 1.66 | 1.54 | 1.48 | 1.39 | 1.25 | 1.25 | 1.40 | 1.37 | 1.42 |
| Stiffness | 1.42 | 1.32 | 1.35 | 1.33 | 1.24 | 1.30 | 1.52 | 1.60 | 1.38 |
| Mood      | 1.77 | 1.61 | 1.61 | 1.51 | 1.34 | 1.35 | 1.47 | 1.27 | 1.49 |
| Swelling  | 1.33 | 1.14 | 1.10 | 1.01 | 0.91 | 0.94 | 1.01 | 0.79 | 1.03 |

3: Strongly agree 2: Agree 1: Somewhat agree 0: Neutral

-1: Somewhat disagree -2: Disagree -3: Strongly disagree

Table 7 shows the results of the chi-square test on changes in subjective health status by gender. In all aspects of health status changes, the average subjective evaluation by women was significantly higher ( $p < 0.001$ ). The largest differences in averages were observed in improvements in cold sensitivity (-0.339), skin (-0.223), and swelling (-0.191).

Table 7. Chi-Square Analysis of Changes in Health Status

|           | Asymptotic Significance (2-sided)<br>p-value | Mean<br>Male/Female | Mean Difference |
|-----------|----------------------------------------------|---------------------|-----------------|
| Healthy   | <0.001**                                     | 1.48/1.56           | -0.078          |
| Happiness | <0.001**                                     | 1.59/1.75           | -0.163          |
| Sleep     | <0.001**                                     | 1.56/1.65           | -0.093          |
| Skin      | <0.001**                                     | 1.41/1.64           | -0.223          |
| Appetite  | <0.001**                                     | 1.28/1.36           | -0.079          |
| Stress    | <0.001**                                     | 1.57/1.65           | -0.079          |
| Fatigue   | <0.001**                                     | 1.54/1.65           | -0.114          |
| Cold      | <0.001**                                     | 1.21/1.55           | -0.339          |
| Stiffness | <0.001**                                     | 1.24/1.39           | -0.154          |
| Mood      | <0.001**                                     | 1.40/1.57           | -0.165          |
| Swelling  | <0.001**                                     | 0.93/1.12           | -0.191          |

Significance: &lt;0.01\*\*, &lt;0.05\*

Table 8 shows the dimension contributions of correspondence analysis, and Figure 2 shows the results of correspondence analysis of changes in health status. According to the scores of Dimension 1 shown in Table 8, improvements in cold sensitivity and swelling were mainly felt by women (8 Cold: 0.413, 11 Swelling: 0.297), especially those younger than their 90s. Men and women in their 90s felt improvements in appetite and overall health (5 Appetite: -0.207, 1 Healthy: -0.157). Dimension 2 scores indicate that younger individuals felt improvements in stress and swelling (6 Stress: 0.148, 11 Swelling: 0.101), while older individuals felt improvements in stiffness and cold sensitivity (9 Stiffness: -0.385, 8 Cold: -0.125). In Figure 2, women in their 20s and 30s (22, 32) are scattered near 11 Swelling and tend to feel improvement in swelling. Women in their 40s, 50s, and 60s (42, 52, 62) are scattered near 4 Skin and tend to feel improvement in skin quality. Men in their 20s and 30s (21, 31) are scattered near 2 Happiness and 10 Mood and tend to feel an improvement in happiness and mood. Men in their 40s (41) are scattered near 1 Healthy, 3 Sleep, 6 Stress, and 7 Fatigue and tend to feel improvement in health, sleep, stress reduction, and fatigue reduction. Men in their 50s, 60s, 70s, and 80s (51, 61, 71, 81) are scattered near 1 Healthy and 5 Appetite and tend to feel improvement in health and appetite.

Table 8. Dimension and Contribution (Changes in Health Status)

| Index        | Mass  | Score in Dimension |        |       | Inertia | Contribution                     |                                  |       |       |
|--------------|-------|--------------------|--------|-------|---------|----------------------------------|----------------------------------|-------|-------|
|              |       | 1                  | 2      |       |         | Of Point to Inertia of Dimension | Of Dimension to Inertia of Point |       | Total |
|              |       |                    |        |       |         | 1                                | 2                                |       |       |
| 1            | 0.095 | -0.169             | 0.02   | 0     | 0.084   | 0.002                            | 0.498                            | 0.004 | 0.503 |
| 2            | 0.105 | -0.014             | 0.001  | 0     | 0.001   | 0                                | 0.022                            | 0     | 0.023 |
| 3            | 0.101 | -0.092             | 0.037  | 0     | 0.027   | 0.007                            | 0.277                            | 0.026 | 0.304 |
| 4            | 0.095 | 0.14               | 0.09   | 0     | 0.058   | 0.04                             | 0.472                            | 0.116 | 0.588 |
| 5            | 0.082 | -0.204             | -0.096 | 0     | 0.1     | 0.06                             | 0.595                            | 0.079 | 0.673 |
| 6            | 0.1   | -0.139             | -0.146 | 0     | 0.06    | 0.112                            | 0.445                            | 0.296 | 0.741 |
| 7            | 0.099 | -0.079             | 0.065  | 0     | 0.019   | 0.022                            | 0.433                            | 0.174 | 0.607 |
| 8            | 0.086 | 0.412              | -0.124 | 0.001 | 0.451   | 0.068                            | 0.923                            | 0.05  | 0.972 |
| 9            | 0.082 | -0.078             | -0.386 | 0     | 0.015   | 0.637                            | 0.061                            | 0.903 | 0.964 |
| 10           | 0.092 | 0.047              | 0.089  | 0     | 0.006   | 0.038                            | 0.182                            | 0.397 | 0.578 |
| 11           | 0.063 | 0.296              | 0.102  | 0     | 0.173   | 0.035                            | 0.769                            | 0.055 | 0.823 |
| Active Total | 1     |                    |        | 0.002 | 1       | 1                                |                                  |       |       |

a. Symmetrical normalization

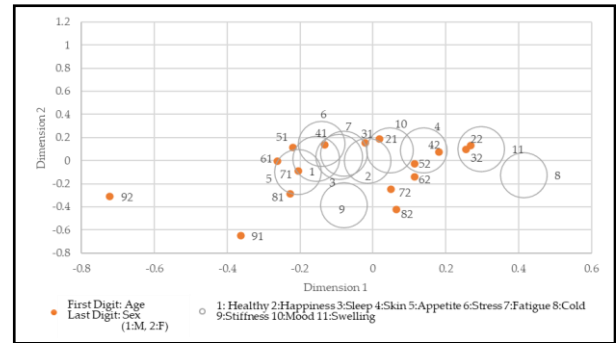


Figure 2. Correspondence Analysis (Changes in Health Status)

#### 4. DISCUSSION

Data collection was based on responses to a questionnaire that sampled 15,608 respondents who had visited Japanese hot springs. Table 3 confirms that the primary purpose of travel or hot spring visit was hot springs, with an average of 70%, followed by hobbies (60%), refreshment (46%), relieving fatigue (29%), and recuperation of illness (19%).

The continuous approach of consumer demand in health tourism implies the existence of two poles. One of them is the "soft" one, which calls for high-quality wellness services, healthy eating, nature walks, fitness facilities, beauty services, and relaxation massages. The "soft" ones in Japan also include visitors for health, food, and art. In this study, the results show that most of the visitors are for onsen (hot spring) and health purposes (Inoue, Akiko, and Uchida, Aya (2016) [2]. This means that purposes other than onsen and health purposes have not yet penetrated the market.

The results of the chi-square test presented in Table 4 reveal that there are marked differences in the purpose of travel by gender. In particular, the frequency of women traveling for the purposes of hot springs, accommodations, improving neuralgia, refreshment, and beauty was significantly higher. This suggests that these activities are particularly attractive to women or that women appreciate the benefits they derive from these activities. According to a previous study, a higher proportion of women than men reported pain in the past week, and women were significantly more likely to report chronic widespread pain (K. H. Todd, K. G. Funk, J. P. Funk, and R. Bonacci (1996) [2]. Additionally, the population prevalence of common chronic pain conditions such as fibromyalgia, migraine, and chronic tension-type headache was found to be higher in women than in men (R.B.Fillingim, D.M.Doleys, R.R.Edwards, and D.Lowery (2003) [3]. Traveling alone allows women to increase their relaxation, which helps them overcome stress (Hamid, S.; Ali, R.; Azhar, M.; Khan, S. (2021) [4].

On the other hand, travel for tourism, sports, work, and purposelessness was significantly more frequent for men, reflecting either that men are more active in leisure and work-related travel or that they are more interested in travel for these purposes. As for purposeless travel, it is possible that men are subordinate to women in their visits to the hot

springs. Previous studies suggest that men and women have different travel preferences (French, J.; Russel-Bennett, R.; Mulcahy, R. (2017) [2]; Osman, H.; Brown, L.; Phung, T. (2019) [3]. Men tend to seek contact with nature, explore new places, try new foods, and meet people from other cultures (Heimtun, B.; Abelsen, B. (2014) [3]. They are drawn to adventure, local arts, and cultural activities (Yang, J.; Zhang, D.; Liu, X.; Li, Z.; Liang, Y. (2022) [3]. Additionally, young, single men traveling alone often look for sports (Heimtun, B. et al. (2014).

The results of the correspondence analysis in Table 5 and Figure 1 clearly highlight age and gender trends regarding the purpose of travel and use of hot springs. The scores in Dimension 1 indicate that the proportion of travel for the purpose of recovery from illness or disease amelioration increases with increasing age. This reflects the greater emphasis older adults place on health care and treatment. Hot springs are mainly used for health tourism (Szromek, Adam R., and Grzegorz Polok (2022) [3]. Younger age groups indicate that they are more likely to travel for work purposes or for no specific purpose. This suggests that workers visit hot springs primarily for work-related purposes, rather than for health benefits (Matsushita, Keita (2021) [4].

Dimension 2 scores confirm that young and middle-aged adults, especially 20s to 50s men, are more likely to travel for work or for no purpose. The results also indicated that women, especially 30s to 50s women, are more likely to travel for beauty purposes. This reflects the higher interest in beauty and self-care among women (Little, J. Pampering (2013) [3].

Figure 1 shows trends by age and gender by purpose. The middle-aged group, consisting of men and women in their 30s, 40s, and 50s (31, 32, 41, 42, 51, 52), tends to prefer travel for leisure and refreshment.

Men and women in their 60s (61, 62) tend to prefer travel for hot springs, socializing with relatives and friends, and hobbies. These are associated with relaxation and maintaining social ties.

For men in their 80s, and women in their 70s to 90s (72, 81, 82, 92), health care and recuperation, as well as shopping are the primary objectives. Among the elderly, women tend to particularly prefer these activities.

Men in their 90s are more likely to choose to travel for the purpose of recovering from fatigue. Very elderly men have shown that maintaining or restoring physical fitness is important to them.

This correspondence analysis confirms that there are marked differences in the purpose of travel based on age and gender (Ritchie, J. B. and Zins, M. (1978) [3]. Younger people tend to focus on work and aimless travel, women on beauty and refreshment, and older people on health care and socializing with relatives. These findings are very useful for the travel industry to develop services and promotions tailored to target demographics. In addition, understanding the social context and individual needs will help provide a more personalized travel experience.

The aggregate results by age group for subjective well-being shown in Table 6 provide insight into the impact of travel on people in each age group.

The highest average value for happiness suggests that hot spring travel has the effect of significantly improving people's overall sense of well-being. It can be said that hot spring travel contributes to the improvement of happiness because they provide mental satisfaction through refreshment from daily life and new experiences (Lin, C. H. (2014) [3].

The higher average value for improved sleep also suggests that travel has a relaxing effect and improves sleep quality. In particular, travel to hot springs and places rich in nature is thought to have a positive effect on sleep (Clark-Kennedy, J., & Cohen, M. (2017) [3].

In addition, the higher average value of fatigue improvement indicates that travel is effective in reducing physical and mental fatigue. It is thought that being free from the stresses of daily life and workload contributes to the recovery of fatigue (de Moraes Silva, M. A., Nakano, L. C., Cisneros, L. L., & Miranda Jr, F. (2023).

And the higher mean value for stress improvement also indicates that travel is effective in reducing stress. Traveling to refresh and change one's mood is very effective as part of stress management (de Moraes Silva, M. et al. (2023) [3].

Furthermore, the high average value for health improvement also suggests that hot spring travel contributes to better overall health. The results indicate significant mental health benefits such as improved well-being, sleep, fatigue, and stress.

The results of the inter-gender chi-square test for subjective health status changes presented in Table 7 indicate that for all health status changes, the mean subjective rating for women is significantly higher ( $p < 0.001$ ). This result suggests that women perceive the improvement in health status resulting from travel more strongly than men.

One particularly significant change in health status is that women's subjective rating of improvement in cold sensitivity is significantly higher than men's. Women are more sensitive to cold than men, and it is possible that the hot springs and warm environment during the travel were more effective in improving cold sensitivity.

Women also rated the improvement of their skin more highly than men. It is thought that women especially felt the effects of beauty travel and the mineral components of hot springs on improving skin conditions.

Women also rated the improvement of swelling higher than men. It is thought that relaxation, exercise, and changes in diet during the travel contributed to the reduction of swelling.

These results indicate that travel is particularly effective in improving health for women. The significant improvements in cold sensitivity, skin, and swelling for women may reflect the fact that the environment and activities during travel are better

suited to women's health needs(de Moraes Silva, M. et al. (2023).

It is important to develop services and promotions that take these gender differences into account in the tourism and healthcare industries. Developing travel packages with beauty and health improvement themes targeting women in particular and strengthening promotion of spa facilities would be effective(Chen, K. H., Liu, H. H., & Chang, F. H. (2013) [2].

In addition, the overall trend indicates that there exists a common effect of improved health status for each age group. Future research will be required to analyze detailed data by age group and propose travel plans that meet the characteristics and needs of each age group.

The results of the correspondence analysis presented in Table 8 and Figure 2 reveal gender- and age-specific trends in health status changes.

Dimension 1 scores indicate that improvements in cold sensitivity and swelling are felt primarily by women, especially those not in their 90s. These health problems are more common among women, indicating that the warming effects of hot springs are particularly beneficial. Appetite and general health improvements are also felt primarily by men and women in their 90s. This suggests that men are experiencing improvements in diet and general health.

Dimension 2 scores indicate that the younger age groups are particularly experiencing improvements in stress and swelling. Younger generations experience more stress in their daily lives, and hot springs are thought to help alleviate this stress. It also indicates that the elderly especially feel relief from stiffness and cold sensitivity. The elderly often suffer from these symptoms, and hot springs are thought to be an effective countermeasure.

Figure 2 shows changes in health status by age and gender, with women in their 20s and 30s (22,32) tending to experience improved swelling. Younger women are more sensitive to swelling and feel that the hot springs are effective.

Women in their 40s, 50s, and 60s (42,52,62) tend to experience improvement in skin texture. Middle-aged women are more interested in beauty, indicating that hot springs and beauty-related services are particularly effective.

Men in their 20s and 30s (21,31) tend to experience a sense of well-being and mood improvement. Younger men indicate that mental refreshment through hot springs is important to them.

Men in their 40s (41) tend to experience improved health, better sleep, reduced stress, and less fatigue. This age group is often stressed at work and at home, indicating that the benefits of hot springs are helpful in reducing stress.

Men in their 50s to 80s (51,61,71,81) tend to experience improved health and appetite. Middle-aged men indicate that maintaining general health and improving appetite are important to them.

This study suggests that gender-based preferences play a significant role in the choice of travel purposes and

perceived health benefits. Women showed a higher preference for beauty, refreshment, and health-related travel purposes, while men leaned more towards sightseeing and work-related travel. These preferences highlight the need for the travel and tourism industry to cater to gender-specific interests to enhance overall satisfaction and health outcomes.

This correspondence analysis reveals that travel contributes to improvements in a variety of health conditions for each age group and gender. Younger people experienced improvement in stress and swelling, middle-aged people experienced improvement in skin quality, and older people experienced particular benefits in reducing cold sensitivity and stiff shoulders. In addition, women indicated that they especially felt improvement in cold sensitivity and swelling, and men in particular felt improvement in appetite and general health (Lin, C. H. (2014).

It is important for the travel and healthcare industries to use these results to develop services and promotions tailored to target demographics. In particular, offering targeted travel packages, such as cold sensitivity and swelling improvement programs for women, stress reduction plans for the younger generation, and health maintenance programs for the elderly, can increase customer satisfaction.

Older adults, particularly those in their 70s and 80s, showed a strong preference for travel aimed at health management and disease recovery, reflecting their higher health needs. Younger individuals, on the other hand, displayed a more exploratory and work-related travel pattern, indicating their active lifestyle and career-oriented focus.

The significant gender differences in perceived health improvements, particularly in cold sensitivity, skin condition, and swelling, emphasize the importance of tailoring wellness programs to meet specific health concerns. Women, being more sensitive to these issues, can benefit significantly from targeted wellness services that address these specific needs. Men, showing improvements in overall health and appetite, could benefit from programs focusing on general wellness and nutritional health.

## 5. CONCLUSION

This study, based on a survey of 15,608 hot spring visitors in Japan, reveals that hot springs are the primary purpose for travel, with women showing high interest in beauty, refreshment, and health improvement, while men often travel for sightseeing and work. Age-wise, older adults prioritize health management and treatment, whereas younger people prefer work and exploratory travel. Women reported stronger health improvement effects from traveling, particularly in alleviating cold sensitivity, improving skin condition, and reducing swelling. Men experienced significant improvements in overall health and appetite. These findings highlight the critical role of travel in promoting mental and physical health. The travel and healthcare industries should develop targeted services

and promotions considering gender and age-specific characteristics. Offering specialized travel packages, such as beauty and health improvement programs for women, stress relief plans for young people, and health maintenance programs for the elderly, can enhance customer satisfaction. The limitation of the study lies in the reliance on subjective survey items without physiological tests, suggesting that future research should include physiological assessments.

## 6. LIMITATIONS

While this study provides valuable insights into the motivations and health outcomes of hot spring visitors in Japan, it is not without limitations. The reliance on subjective survey responses introduces potential biases, as self-reported data can be influenced by personal perceptions and experiences. Additionally, the absence of physiological measurements means that the reported health benefits are not corroborated by objective health data. Future research should incorporate physiological assessments to validate the subjective health improvements reported by the respondents.

## 7. AUTHOR CONTRIBUTIONS

Conceptualization, T. Oda and Y. Kanegae; methodology, T. Oda and C. Oda; validation, T. Oda and C. Oda; formal analysis, T. Oda and C. Oda; investigation, T. Oda and S. Hayasaka; data curation, T. Oda and S. Hayasaka; writing—original draft preparation, T. Oda; writing—review and editing, S. Hayasaka and Y. Kanegae; visualization, T. Oda and C. Oda; supervision, Y. Kanegae; project administration, T. Oda, S. Hayasaka, and Y. Kanegae. All authors have read and agreed to the published version of the manuscript.

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## 10. CONFLICTS OF INTEREST

The authors declare no conflicts of interest associated with this study.

## 11. REFERENCES

- Bookman, Milica Z., and Karla R. Bookman. *Medical Tourism in Developing Countries*. Palgrave Macmillan, 2007.
- Larisa-Florenta, I. L. E., et al. "The Values, Perception and Attitudes of Potential Domestic Tourists Regarding the Medical Tourism Offer of Romania." *Balneo and PRM Research Journal*, vol. 12, no. 2, 2021, pp. 151–164. DOI: 10.12680/balneo.2021.435.
- Hayasaka, Shinya, et al. "Nationwide 'New Touji' Effectiveness Measurement Survey (FY 2018–2020)." *Japan Journal of Health Development*, vol. 43, 2022, pp. 27–37.
- Lee, Cheng-Fei. *An investigation of factors determining the competitiveness of Taiwan's hot springs tourism sector*. Diss. Victoria University 2006. DOI: Not available.
- Agresti, A. *An Introduction to Categorical Data Analysis*, 3rd ed.; Wiley, 2019. DOI: 10.1002/9781119405269
- McHugh, Mary L. "The Chi-Square Test of Independence." *Biochemia Medica*, vol. 23, 2013, pp. 143–149. DOI: 10.11613/BM.2013.018.
- Greenacre, Michael. *Correspondence Analysis in Practice*. 3rd ed., CRC Press, 2017. DOI: 10.1201/9781315369983.
- Inoue, Akiko, and Aya Uchida. "A Study on the Formation of Attractive Stay Structure in Onsen (Hot Springs)." *Transactions of the Japan Society for International Tourism*, vol. 23, 2016, pp. 29–38.
- Heimtun, Bente, and Beate Abelsen. "Singles and Solo Travel: Gender and Type of Holiday." *Tourism, Culture & Communication*, vol. 13, 2014. DOI: 10.3727/109830414X13911221027443.
- Fillingim, Roger B., et al. "Clinical Characteristics of Chronic Back Pain as a Function of Gender and Oral Opioid Use." *Spine*, vol. 28, no. 2, 2003, pp. 143–150. DOI: 10.1097/00007632-200301150-00010.
- Hamid, S., et al. "Solo Travel and Well-Being Amongst Women: An Exploratory Study." *International Journal of Tourism and Leisure*, vol. 2, 2021, pp. 1–13.
- French, Jeff, Rebekah Russell-Bennett, and Rachel Mulcahy. "Travelling Alone or Travelling Far? Meso-Level Value Co-Creation by Social Marketing and For-Profit Organisations." *Journal of Social Marketing*, vol. 7, 2017, pp. 280–296. DOI: 10.1108/JSOCM-12-2016-0088.
- Osman, H.; Brown, L.; Phung, T. *The Travel Motivations and Experiences of Female Vietnamese Solo Travellers*. *Tour. Stud.* 2019, Volume 20, 146879761987830. DOI: 10.1177/1468797619878307
- Heimtun, B.; Abelsen, B. *Singles and Solo Travel: Gender and Type of Holiday*. *Tour. Cult. Commun.* 2014, Volume 13. DOI: 10.3727/109830414X13911221027443
- Yang, J.; Zhang, D.; Liu, X.; Li, Z.; Liang, Y. *Reflecting the Convergence or Divergence of Chinese Outbound Solo Travellers Based on the Stimulus-Organism-Response Model: A Gender Comparison Perspective*. *Tour. Manag. Perspect.* 2022, Volume 43. DOI: 10.1016/j.tmp.2022.100982
- Szromek, Adam R., and Grzegorz Polok. *A business model for spa tourism enterprises: transformation in a period of sustainable change and humanitarian crisis*. *Journal of Open*

Innovation: Technology, Market, and Complexity, 2022, Volume 8.2: 72. DOI: 10.3390/joitmc8020072

17. Matsushita, Keita. Workations and their impact on the local area in Japan. *The Flexible Workplace: Coworking and Other Modern Workplace Transformations*, 2021: pp.215-229. DOI: 10.1007/978-3-030-62167-4\_12
18. Little, J. Pampering, Well-being and women's bodies in the therapeutic spaces of the spa. *Social & Cultural Geography*, 2013, Volume 14(1), pp.41-58. DOI: 10.1080/14649365.2012.734846
19. Ritchie, J. B. and Zins, M. Culture as determinant of the attractiveness of a tourism region. *Annals of tourism research*, 1978, Volume 5(2), pp.252-267. DOI: 10.1016/0160-7383(78)90223-2
20. Lin, C. H. Effects of cuisine experience, psychological well-being, and self-health perception on the revisit intention of hot springs tourists. *Journal of Hospitality & Tourism Research*, 2014, Volume 38(2), pp.243-265. DOI: 10.1177/1096348012451460
21. Clark-Kennedy, J., and Marc Cohen. "Indulgence or Therapy? Exploring the Characteristics, Motivations and Experiences of Hot Springs Bathers in Victoria, Australia." *Asia Pacific Journal of Tourism Research*, vol. 22, no. 5, 2017, pp. 501–511. DOI: 10.1080/10941665.2016.1276946.
22. de Moraes Silva, M. A., et al. "Balneotherapy for Chronic Venous Insufficiency." *Cochrane Database of Systematic Reviews*, no. 1, 2023. DOI: 10.1002/14651858.CD013085.pub3.
23. Chen, K. H., H. H. Liu, and F. H. Chang. "Essential Customer Service Factors and the Segmentation of Older Visitors within Wellness Tourism Based on Hot Springs Hotels." *International Journal of Hospitality Management*, vol. 35, 2013, pp. 122–132. DOI: 10.1016/j.ijhm.2013.05.013.