

Evaluation of Emotions Related to the Benefits of Inconvenience Using PANAS and Tourism Engineering*

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Abstract—This study investigates the “benefit of inconvenience” of tourist support tools on emotional experiences. Using the Positive and Negative Affect Schedule (PANAS), we evaluated how participants’ emotions are influenced by using a “Blur Navigation” and an “Unfriendly Camera” during tourism in some sight-seeing areas of Kyoto Japan. The research involved measuring participants’ emotional states before and after their experience to assess the impact of these tools on their feelings. The goal is to explore whether inconvenient tourist support tools can contribute to a more engaging and meaningful travel experience. By examining the emotional responses associated with these tools, this study confirms the “benefit of inconvenience” in tourism. The experimental results revealed that such emotional factors as the positive emotions “excited” and “alert,” and the negative emotions “distressed,” “irritable,” and “nervous” were significantly correlated with spatial awareness derived from inconvenience.

I. INTRODUCTION

It is generally believed that convenience enriches lives, but it can sometimes cause problems [1], [2]. For example, a washing machine simplifies laundry, but automation hides the cleaning process, which may lead to issues in human-machine systems.

Making things more convenient can also be a double-edged sword in tourism. Convenience tools like navigation apps can lead users to focus solely on reaching their destination, missing out on the journey and scenery. Over-reliance on such tools may also diminish one’s abilities as a “tourist.”

In contrast, there is a concept known as the “benefit of inconvenience” [3]. It refers to the benefits derived from inconvenience and actively evaluates the positive aspects of inconvenience. In this study, to deepen the understanding of the “benefit of inconvenience,” we introduce PANAS [4], an emotional assessment scale, to identify which emotions contribute to the “benefits” derived from inconvenience. First, we developed inconvenient tourism tools, and then we conducted an emotional evaluation using PANAS before and after using these tools during a sightseeing experience.

II. DEVELOPMENT AND EVALUATION EXPERIMENTS OF TOURISM SUPPORT TOOLS THAT PROVIDE THE BENEFIT OF INCONVENIENCE

Some entertainment facilities, like giant mazes and jigsaw puzzles, intentionally introduce inconvenience to evoke positive emotions. The tourism support systems reported in this paper were designed to create the same emotions.

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A. Research on the Benefit of Inconvenience in Tourism

Many studies investigate the utility of inconvenience in tourism. For example, an experiment with an electronic map showing only pre-set destinations and current locations suggested that unexpected encounters could make tourism more memorable [5]. Another study using a map that only shows the current location, destination, landmarks, and directions encouraged exploration and led to increased discoveries [6]. A tourism system presenting photos of spots and events at different seasons aims to create a sense of incompleteness, encouraging revisits [7]. Other approaches like hide-and-seek tourism guidance [8] and using travel journals [9] also introduce new inconvenient elements into tourism experiences. These studies are based mainly on questionnaire surveys.

B. Development of Inconvenient Tourism Tools

Studies that investigate the utility of inconvenience in tourism often introduce specific tourism tools. In this research, we focused on navigation and cameras, as these are commonly used tools in tourism for efficient movement and memory recording. We incorporated inconvenience into these tools and developed experimental versions.

a) Blur Navigation: Based on the “Blur Navigation” [10], which was reported in the experiment in 2010, we developed a new version by incorporating current technology and adding several functions. Figure 1 shows its interface.

When a standard modern map app is used for tourism, the user often becomes focused solely on reaching the destination, which reduces the opportunities to enjoy the scenery along the route. Moreover, frequent use of the map app can interfere with route memory and potentially diminish landscape memory. To address these issues, we added the following three functions to the app:

- 1) No search function
- 2) The walked path gradually blurs
- 3) The image changes based on the distance walked

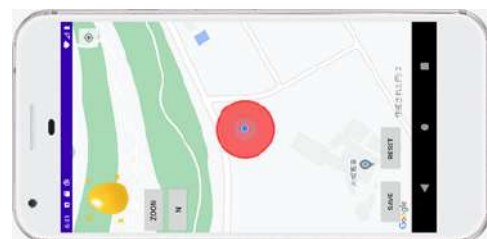


Fig. 1. The Blur Navigation

b) *Unfriendly Camera*: A standard camera app focuses on taking a photo quickly, which can disrupt the tourism experience. Recently, intentionally inconvenient camera apps have gained attention. For example, “TOMO” [11] has a difficult-to-see viewfinder, and photos can only be viewed after 36 shots and a 72-hour wait, creating anticipation. “NOMO CAM” [12] processes photos like instant camera shots, gradually revealing them over 90 seconds, with shaking speeding up the process.

While using these inconvenient apps as they are for tourism is intriguing, we developed a different camera app. Figure 2 shows its interface. This app includes the following features:

- The shutter cannot be pressed unless at least one character is entered as the “reason for taking the photo” and the “location.”
- After that, the photo is taken after a 3-second delay, during which the reason and location are displayed.
- Up to 10 reasons and locations can be stored, and the oldest information is deleted first.

These features encourage users to reconsider the original purpose of taking the photo, thereby deepening the impression of the images. The 3-second delay provides a moment of pause during shooting, contributing to practice in handling the camera. The small viewfinder, reminiscent of older cameras, prompts users to appreciate the actual scenery.



Fig. 2. Unfriendly Camera

C. Experimental Location and Participants

The experiment was conducted in the Uzumasa area of Kyoto City (Uzumasa Eigamura, Koryu-ji Temple, and Kono Jinja Shrine), and the Arashiyama area (Mikami Shrine, Rakushisha, and Kurumazaki Shrine). These locations are characterized by narrow roads that are difficult for cars to navigate, making them suitable for pedestrian movement. Additionally, each destination offers various routes, creating an environment conducive to participants getting lost. The experiment was carried out under clear weather conditions, and the chosen destinations were slightly removed from well-

known tourist spots, resulting in relatively low levels of crowding.

The experiment involved 35 participants in their early 20s who reside in the Kansai region and have easy access to the Uzumasa and Arashiyama areas. This included 24 participants (22 men and 2 women) in the Uzumasa area and 11 participants (8 men and 3 women) in the Arashiyama area. Among them were international students. In the Uzumasa area, the participants engaged in group tourism, while in the Arashiyama area, the participants conducted individual tours.

The conditions for each case are shown in Table I. The numbers in parentheses indicate the number of participants. For the Uzumasa tourism, the participants who used both inconvenient cameras and maps were divided into two groups, labeled AB1 and AB2.

TABLE I
CONDITION OF CASES OF GROUP & INDIVIDUAL EXPERIMENT

Group/ Individual	Regular map	Inconvenient map
Regular camera	O (4)/ O (2)	A (5)/ A (3)
Inconvenient camera	B (5)/ B(3)	AB1,2 (6,4)/ AB (3)

D. Experimental Method

1) *Arashiyama Tourism*: The group tourism experiment conducted in Uzumasa revealed the following issues:

- 1) The use of the provided smartphone app did not reach all participants due to the group setting.
- 2) The proximity of the experiment location to the university where the participants were enrolled meant that participants were likely familiar with the area.
- 3) Participants knew the concept of “benefit of inconvenience” before the experiment, which may have led them to view “inconvenience” positively.

To address these issues, the experiment in Arashiyama incorporated the following improvements. First, participants conducted the tourism individually. Next, the experimental locations are not so familiar to participants. Additionally, the concept of “benefit of inconvenience” was not explained to participants until after the experiment concluded.

Each participant was provided a Google Pixel 3a (Android) with the experimental app and instructed on its use. Starting from Randen Arashiyama Station, they visited three designated locations (Section II-C) within a two-hour time limit and returned to the university via the nearest Randen station. The destinations were disclosed only on the day to prevent prior research, and participants were instructed to avoid repeating routes to increase interaction with the inconvenient features.

2) *Survey Using PANAS*: In this experiment, participants completed the Japanese version of PANAS [13] twice: before and after the tour. The survey evaluated the following three aspects:

- 1) Current Mood
- 2) Feelings When Lost
- 3) Feelings When Enjoying the View

For item 2, participants answered based on their imagination before the tour and recalled their actual feelings after getting lost. For item 3, they viewed a photo of the destination before the tour and answered based on their feelings after seeing the actual scenery. Each item was rated on a 6-point Likert scale, with eight positive and eight negative emotions listed in Table II. The score for positive emotions (P score) ranges from 8 to 48, and the score for negative emotions (N score) has the same range. Both scores could change pre- and post-tour.

TABLE II
EMOTIONS OF JAPANESE PANAS [13]

Positive emotions	Negative emotions
熱狂した (enthusiastic)	びくびくした (jittery)
きっぱりとした (determined)	恥じた (ashamed)
強気な (strong)	苦悩した (distressed)
活気のある (active)	心配した (afraid)
わくわくした (excited)	びりびりした (nervous)
気合いの入った (inspired)	いらだった (irritable)
誇らしい (proud)	うろたえた (upset)
機敏な (alert)	おびえた (scared)

3) Survey on App Features and Tourism Experience:

After the tour, participants were asked to respond to a questionnaire including items such as "Differences from Previous Sightseeing" and "Impressions of the Experiment."

4) *Spatial Awareness Quiz*: A spatial awareness quiz was conducted one week after the experiment. It included 10 photos from the route and 10 dummy photos. Participants marked locations as ○ (passed), × (not passed), or △ (unsure). △ was included to reduce random guesses. The photos were whitewashed to obscure features.

For the Arashiyama Individual Tour, the quiz was scored out of 40 points: "correct" = 2, △ = 1, "wrong" = 0. For the Uzumasa Group Tour, the quiz used an OX format scored out of 20 points: "correct" = 1, "wrong" = 0.

III. EXPERIMENTAL RESULTS

A. PANAS Survey (Individual)

Table III summarizes the proportion of participants with increased P scores and decreased N scores for "Current Mood." Changes with no difference pre- and post-tour were also counted.

Figure 3 shows individual changes in P and N scores, with horizontal arrows indicating P score increases and vertical downward arrows showing N score decreases.

Results for "Feelings When Lost Way" and "Feelings When Enjoying the View" are presented in Tables IV and V, and Figs. 4 and 5, respectively.

Good results indicate an increase in P value and a decrease in N value, while bad results show the opposite.

1) *Current Mood*: Figure 3 and Table III show that the N value decreased in all cases except Case A, where only one participant showed a minimal increase. The P value increased for 67% of participants in Cases A and AB, compared to 33% in Case B, suggesting that the use of an inconvenient map app enhances mood improvement.

TABLE III
PANAS ON CURRENT MOOD (INDIVIDUAL)

Case	O	A	B	AB	All
P increase (%)	50	67	33	67	55
N decrease (%)	100	67	100	100	91

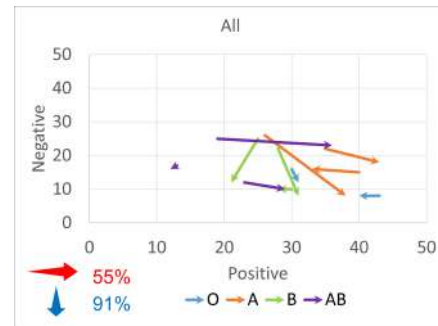


Fig. 3. PANAS on Current Mood (Individual)

TABLE IV
PANAS ON FEELINGS WHEN THE LOST WAY (INDIVIDUAL)

Case	O	A	B	AB	All
P increase (%)	50	67	33	67	55
N decrease (%)	100	100	100	100	100

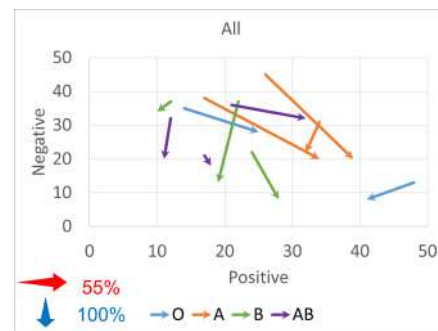


Fig. 4. PANAS on Feelings When the Lost way (Individual)

TABLE V
PANAS ON FEELINGS WHEN ENJOY THE VIEW (INDIVIDUAL)

Case	O	A	B	AB	All
P increase (%)	100	100	100	100	100
N decrease (%)	100	0	67	100	55

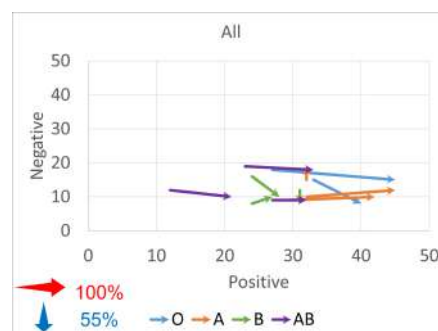


Fig. 5. PANAS on Feelings When enjoy the view (Individual)

2) *Feelings When the Lost Way*: Table IV indicates a 67% increase in the P value for Cases A and AB, with 100% of participants showing a decrease in the N value. This suggests that actual sightseeing alleviates negative feelings associated with getting lost. Figure 4 shows no leftward upward arrows (bad results).

3) *Feelings When Enjoy the View*: Table V shows a P value increase for all participants, reflecting the emotional impact of seeing scenery in person. In Case A, all participants showed a slight increase in the N value, possibly due to the longer travel distance contributing to stress. Figure 5 shows no leftward upward arrows (bad results).

B. The Spatial Awareness Quiz

The average scores and standard deviations are shown in Fig. 6. Although the Uzumasa Tour was conducted in groups, participants answered the quiz individually.

In the individual sightseeing in Arashiyama, as shown on the left side of Fig. 6, Case B, which used only the inconvenient camera, had the highest average score. This is likely because participants in Case B used the camera more frequently compared to those in Case AB. Participants in Case AB, who were occupied with using the inconvenient map, likely had less opportunity to use the inconvenient camera. Moreover, the significance is also recognized with $p = 0.0267 < 0.05$.

This suggests that using an inconvenient camera helps in better memorizing the scenery and surrounding paths.

In the group sightseeing in Uzumasa, as shown on the right side of Fig. 6, it was observed that groups using the inconvenient app showed improved spatial awareness. This is likely because the inconvenience led to getting lost, which made participants observe their surroundings more closely and aim for the destination.

Furthermore, the inconvenience of the map may have caused participants to rely less on it and predict the route using a mental map. However, the average scores for each group ranged from 12.75 to 16.75, showing no major differences. This may be due to the OX quiz format, which probabilistically makes it easier to score above 10 points.

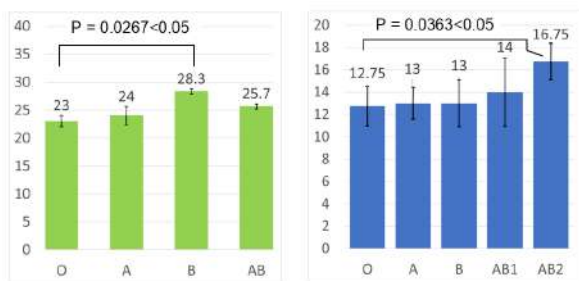


Fig. 6. Average spatial awareness scores: Individual (left) and Group (right)

C. Comparison between Arashiyama (Individual Tour) and Uzumasa (Group Tour) PANAS

The averages of the PANAS P-values and N-values, along with the subtraction, are shown in Tables VI and VII,

respectively.

1) *Current Mood*: In individual tourism, negative emotions significantly decreased, and positive emotions were strongly expressed, indicating the effective reduction of negative emotions. In contrast, group tourism showed high positive emotions but less reduction in negative emotions, suggesting individual tourism is more effective for emotional improvement. The difference in PN was 7.91 for individual tourism and 3.38 for group tourism, showing a notable contrast.

2) *Feelings When the Lost Way*: In individual tourism, a greater reduction in negative emotions was observed. On the other hand, positive emotions were increased in group tourism. However, no significant differences were found in the difference between positive and negative emotions (PN), suggesting similar emotional changes in both settings.

3) *Feelings When Enjoy the View*: Positive emotions while enjoying the view were higher in individual tourism, likely due to participants' ability to enjoy the scenery at their own pace. In group tourism, while positive emotions were also high, there was less change in negative emotions.

The results indicate that individual tourism enhances positive emotions and reduces negative emotions, whereas group tourism provides a positive experience but with limited changes in negative emotions. This may be because, in individual tourism, participants can enjoy sightseeing at their own pace, while in group tourism, participants may enjoy being with others but may find it difficult to visit the places they want to go. These findings offer valuable insights into understanding the emotional effects of different tourism formats.

TABLE VI
AVERAGE OF PANAS (INDIVIDUAL)

	P	N	Difference (PN)
Current Mood	2.73	-5.18	7.91
the Lost way	3.82	-11.27	15.1
Enjoy the View	7.45	-1.27	8.73

TABLE VII
AVERAGE OF PANAS (GROUP)

	P	N	Difference (PN)
Current Mood	4.04	0.67	3.38
The Lost way	6.54	-8.25	14.8
Enjoy the View	4.58	0.17	4.42

D. Correlation Analysis between PANAS and Spatial Awareness

Since PANAS was conducted twice for each of the three moods before and after the tour, six responses were obtained from each participant. Correlation analysis between the number of correct answers in the spatial awareness quiz and the 16 emotions in PANAS was performed for both Arashiyama individual tours and Uzumasa group tours.

TABLE VIII
CORRELATION BETWEEN EMOTIONS AND QUIZ

	Individual					Group
	Positive		Negative			Positive
	Excited	Alert	Distressed	Irritable	Jittery	Active
Increase in Current Mood	0.80		-0.53	-0.60		
Increase in the Lost way		-0.48			-0.61	
Increase in enjoy the view		-0.70				0.42

TABLE IX
CORRELATION COMPARISON FOR PANAS EMOTIONS ACROSS DIFFERENT CONDITIONS

Condition	Current Mood			The Lost Way		Enjoy the View
	Inspired	Proud	Nervous	Determined	Active	Scared
Overall	-0.087	0.15	-0.12	-0.15	0.055	-0.028
No Camera	-0.70	0.66	0.41	0.69	0.64	0.42
With Camera	-0.24	-0.58	-0.57	-0.69	-0.55	-0.69
Difference	0.46	1.25	0.98	1.38	1.19	1.11
No Map	-0.37	0.77	-0.18	0.25	0.40	0.70
With Map	0.79	0.48	-0.21	0.36	-0.35	0.36
Difference	1.16	0.29	0.036	0.11	0.75	0.34

Multiple regression analysis was conducted on the total P-value and total N-value with the number of correct answers in the spatial awareness quiz. Strong correlations for the Arashiyama individual tour and Uzumasa group tour are summarized in Table VIII, where "increase" denotes the difference before and after the experiment.

In the individual sightseeing in Arashiyama, positive emotions such as "excited" and "alert," and negative emotions such as "distressed," "irritable," and "jittery," were found to have correlations with spatial awareness ability. This suggests that these emotions might be considered beneficial aspects of inconvenience.

In particular, "excited" showed a strong correlation with a coefficient of 0.80. This indicates that the more excited participants were, the more they observed their surroundings and scenery, leading to higher quiz scores.

Additionally, "alert" showed negative correlations with coefficients of -0.48 and -0.70. If we consider "alert" as a quick action, it implies that participants who moved more slowly during sightseeing had higher quiz scores.

For the negative emotions "distressed," "irritable," and "jittery," a notable negative correlation was observed. This suggests that the less negative emotions participants felt, the higher their quiz scores were.

In the group sightseeing in Uzumasa, the emotional factor "active" was found to correlate with spatial awareness ability. This indicates that "active" might be considered a beneficial aspect of inconvenience. Other emotions had a maximum correlation coefficient of 0.039 and showed no significant relationship with spatial awareness ability.

E. Comparison of Correlations between PANAS and spatial awareness by Case

For Arashiyama individual tours, the relative correlations were compared with and without inconvenient maps or cameras. Table IX shows cases where the absolute value of

the overall correlation coefficient is 0.20 or less, and the difference in correlation coefficients between having and not having inconvenience is 0.9 or more.

1) *Current Mood*: For the emotion "enthusiastic," the overall correlation was low, but a strong negative correlation was observed without a camera (-0.70). This suggests that the ease of recording with a regular camera negatively impacted the "enthusiastic" mood.

In contrast, a strong positive correlation was observed with the map (0.79). This is likely because using an inconvenient map led to more frequent getting lost, which increased the motivation to remember details of the scenery.

The difference in correlation between the presence and absence of a map was about 1.16. This indicates that using an inconvenient map made route verification more challenging, leading to increased attention to memory and emotions related to the scenery. As a result, there was a significant difference in the correlation between spatial awareness and emotions between the map and no map conditions.

For the emotion "proud," there was a difference of about 1.25 between the presence and absence of a camera. This suggests that the inconvenience of a camera increased user stress and inconvenience, causing a negative correlation with the "proud" emotion, while a regular camera provided a more comfortable experience.

A similar difference of about 0.98 was observed for the emotion "tense" between the presence and absence of a camera.

2) *Feelings When the Lost Way*: For the emotion "decisive," there was a difference of about 1.38 between the presence and absence of a camera.

3) *Feelings When Enjoy the View*: For the emotion "active," there was a difference of about 1.19 between the presence and absence of a camera. For the emotion "scared," there was a difference of about 1.11 between the presence and absence of a camera.

IV. DISCUSSION

A. Arashiyama Tourism

In this experiment, significant differences were observed between individuals who used inconvenient maps and those who used standard maps. The routes taken by these two groups showed notable variations. Some examples of these routes are shown below.



Fig. 7. Routes that do not use inconvenient maps



Fig. 8. Routes that use inconvenient maps

As shown in Fig. 7, using a standard map app resulted in little variation in the sightseeing routes. In contrast, as illustrated in Fig. 8, using an inconvenient map led to significant differences in the sightseeing routes. Additionally, many participants took longer or incorrect routes that did not lead to the destination. This suggests that using an inconvenient map increases the likelihood of getting lost.

B. Functional and Sightseeing Survey

“Differences from Previous Sightseeing”: Comments like “exploring unknown streets” and “enjoying unfamiliar paths” suggest the inconvenient map made sightseeing more enjoyable than standard apps. Case O, who was using a regular app, only received negative feedback. Case B noted that “explaining the reason for taking photos helps make memories more lasting,” which may explain the highest average score on the spatial awareness quiz.

“Impressions of the Experiment”: Positive comments like “fun” and “interesting” appeared in all cases except Case O, highlighting how the inconvenient app enabled a unique sightseeing experience.

Additionally, the lack of a search function created the positive emotion of choosing unfamiliar routes (**Excited**) and the negative emotion of not knowing if the path was correct (**Afraid**). The camera’s 3-second delay gave participants time to think about the reason for taking a photo, which fostered the positive emotion (**Proud**). However, missing the chance caused the negative emotion (**Irritable**). These features provided a unique experience, different from regular sightseeing.

V. SUMMARY AND FUTURE WORK

This study analyzed the relationship between emotions and inconvenience benefits by combining sightseeing with inconvenient apps and the Japanese version of PANAS. The results are summarized as follows:

Inconvenience enhanced attention to surrounding scenery. Using an inconvenient camera made impressions more memorable due to rechecking during photo shooting, while the absence of an inconvenient map allowed more time and flexibility for photography.

Inconvenient sightseeing also led to emotional changes. In the PANAS for ‘Feeling Lost,’ all participants’ N-values decreased, and in the PANAS for ‘Enjoying the Scenery,’ all P-values increased. Rechecking during photography and getting lost contributed to discovering new paths, and enhancing memory and enjoyment. This increased inconvenience improved landscape memory.

The emotional factors correlated with landscape memory were positive emotions such as “Excited” and “Alert”, as well as negative emotions like “Distressed”, “Frustrated”, and “Nervous”.

This study has limitations, including a small sample size and the need for more accurate emotional measurement methods. Future research should address these issues by expanding the sample and improving emotion measurement. Furthermore, comparing it with more inconvenient systems, which do not provide positive emotions to users, will elucidate the benefit of inconvenience.

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