Cross-Cultural Interpretation of Kansei Vocabulary for Virtual Nature

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Abstract

This study examines how Finnish, Japanese, and English speakers interpret Kansei words in the context of Virtual Nature Experiences (VNE). Through three participatory workshops (n = 20) and a survey, we explored differences between participants' ratings of how well Kansei words described a VNE and their broader emotional associations with those words, particularly for terms such as *Peaceful* and *Nostalgic.* Participants' associations emphasised nature, tranquillity, and experiential qualities, while suggesting that multilingual Kansei words were not always understood in the same way by participants. These findings highlight challenges in selecting and validating multilingual Kansei vocabularies for evaluation tools. The study provides an exploratory foundation for developing a culturally responsive Kansei Evaluation Tool to capture emotional and sensory perceptions of VNE more effectively.

Keywords: *Vocabulary Evaluation, Cross-Cultural Perception, Virtual Nature, Kansei Design*

1 INTRODUCTION

As urbanisation expands, reduced access to natural environments has become a global concern, impacting well-being and psychological health (Larson et al., 2019). Everyday interactions with nature are declining, particularly among younger generations, contributing to stress and diminished mental resilience (Kaplan & Kaplan, 1989; Ulrich, 1981). Especially, how individuals perceive their relationship with the natural world, i.e. Nature Connectedness (NC), is strongly linked to well-being and life satisfaction (Capaldi et al., 2014). While physical nature contact remains essential, virtual technologies are increasingly explored as tools for fostering these connections. Immersive environments, such as 360° videos and computer-generated landscapes, can promote NC when they provide sensory richness and interactivity (Calogiuri et al., 2023). For instance, enhancements such as haptic feedback further improve vitality and mood (Nurmela et al., 2025a). However, existing evaluation methods for VNE are often generic, lengthy, and culturally insensitive, limiting their applicability across diverse user groups.

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This study addresses a critical gap by developing a structured, culturally responsive tool for evaluating VNE. Its primary aim is to explore how participants interpret and emotionally respond to ten previously identified low-level Kansei words (Nurmela et al., 2025b) within multilingual contexts of VN. By applying Kansei-based methodologies, this work advances the KEER discourse and demonstrates its potential to enhance cross-cultural design evaluation in emerging domains such as VN.

2 KANSEI DESIGN-BASED EVALUATION TOOL FOR VIRTUAL NATURE

Kansei is a Japanese concept that encompasses emotions, sensitivity, aesthetics, intuition, and sensory experience (Harada, 1998). Kansei Design (KD) approaches user experience from an affective perspective, emphasising how individuals feel, sense, and interpret stimuli (Nagamachi, 2011). Lee et al. (2002) describe it as reflecting “soft values” within product and spatial design. According to Lokman (2010), Kansei emerges through sensory input (vision, hearing, touch, smell, and taste) processed via emotional and cognitive interpretation. Lévy (2013) further frames KD as a structured methodology for emotional design, integrating these impressions into systematic design processes.

The aim of developing a KD-based evaluation tool is to translate subjective emotional responses to VN into structured and measurable parameters. The process, inspired by the work of Schütte et al. (2024), turns emotional impressions into usable evaluation metrics through four steps: (1) *Domain Definition:* VNE; (2) *Semantic Space Construction:* Kansei words; (3) *Property Space Identification:* visual and interactive attributes of VN; (4) *Testing and Validation* in VN. This paper focuses on step (2) Kansei structure identification in the form of *multilingual workshop*s, where we conduct sessions in Finnish, Japanese, and English to examine how participants interpret and emotionally respond to previously identified Kansei words in the context of VNE (Nurmela et al., 2025b). This stage explores cross-cultural nuances in meaning and affective perception, ensuring that the preliminary vocabulary accurately reflects diverse experiential interpretations before its application in the evaluation tool.

3 STUDY

This section outlines the study and data collection methods, including the participants’ background information, workshops, and the survey.

3.1 Participants

A total of 20 participants took part: nine Finnish speakers, six Japanese speakers, and five English speakers. All were informed of the study procedures at the start of the workshop, and written consent was obtained. Participants were aged 18–24 (n = 8), 25–34 (n = 9), or 35–44 (n = 3). VR familiarity varied: four had never used VR, one had tried it once, twelve had used it 2–5 times, and one had used it more than five times. Spending time in nature was frequent, with 40% visiting weekly, 40% monthly, and 20% daily. Most participants (60%) felt more at home in natural environments; 10% reported a strong preference for nature, 20% preferred a balanced mix of natural and urban environments, and 10% preferred urban settings.

3.2 Workshops

We conducted three participatory workshops, one in Finnish, one in Japanese and one in English. The workshop aimed to evaluate VNE-related preliminary Kansei vocabulary created in previous participatory workshops (Nurmela et al., 2025b). The workshop consisted of three tasks. (1) *Word Association Mapping:* Participants wrote on post-it notes what each word evokes in their mind. (2) *Experience Reflection:* Participants had a short VNE (winter forest walk) and arranged the words on a physical paper scale according to how well the word described their experience. (3) *Multilingual Comparison:* Participants grouped words across languages and discussed the nuances which each word evokes.

3.3 Survey

After the workshop tasks, participants filled out a survey where they were asked to evaluate the same words: (A) *How well the word described their virtual nature experience?* (in the context of the VNE), and (B) *How emotionally connected they felt to this word?* (in general). They evaluated each word using a 5-point Likert scale (1 = not at all; 5 = very well).

4 RESULTS

This section presents the results from the three workshop tasks and the post-session survey with descriptions of the analysis methods.

4.1 Word Association Mapping

The analysis of the data was conducted using the affinity mapping method (Lucero, 2015). The results were analysed by creating an affinity diagram (see Table 1) to categorise the key themes mentioned in the responses. The presented table summarises the thematic categories identified through affinity mapping, a visual technique for organising qualitative data into clusters of semantically related concepts. Affinity mapping enables researchers to group individual data points into meaningful categories, facilitating the identification of patterns and themes across the dataset.

Table 1. The key themes of words evoked by each Kansei word

KANSEI VOCABULARY	THEMES OF WORDS		
Luonto / 自然 / Nature	Nature - Greenness (14)	Silence - Peace (8)	Animals - Environment (6)
Outous / 畏怖 / Strange	Interesting (6)	Scary (5)	Stranger (4)
Rauha / 穏やか / Peaceful	Home - Nature (6)	Safety (4)	Silence (4)
Infrastruktuuri / 街並み / City	Traffic - Noise (7)	Built - Environment (6)	People - Social Spaces (5)
Nostalgia / 郷想 / Nostalgic	Childhood (10)	Memories (8)	Games - Play (6)

Henkisyys / 神秘 / Spirituality	Belief - Beliefs (9)	Experience (5)	Nature (4)
Ympäristö / 環境 / Environment	Nature (7)	Buildings - Environment (5)	Society (3)
Aistillisuus / きれい / Beautiful	Sensitivity (8)	Nature (4)	Aesthetic Experience (4)
Ilmapiiri / 雰囲気 / Atmosphere	Atmosphere - Lived Experience (15)	Air- Space (8)	Senses (4)
Pakoarjesta / 脱日常 / Escapism	Peace - Relaxation (8)	Nature (5)	Travel (5)

The table shows how frequently keywords appeared within broader thematic categories. The most prominent themes relate to Nature and Atmosphere, indicating a strong emphasis on natural elements and experiential qualities in participants' responses. Nostalgic themes such as Childhood and spiritual or belief-related concepts also appear with moderate frequency. In contrast, categories associated with the built environment and urban contexts are present but less prominent. This pattern suggests that participants more often referenced experiences connected to nature, tranquillity, and personal or emotional meaning than those related to urban infrastructure.

4.2 Experience Reflection

The participants were shown a short VNE in the form of a video of a winter forest walk. After the exposure, they arranged words on a physical paper scale based on how well they described their VNE. All the scales were photographed and analysed to capture the average for each language group. Figure 1 presents the distribution of the words across three languages. It can be noticed that most of the words have similar rankings. Although the Japanese group tended to rank these words higher, the small subgroup sizes (n = 5–9) mean these patterns are indicative rather than conclusive. This difference can be seen in the case of *Beautiful,* which is the best-fitting word among the Japanese, whereas it comes after *Nature* and *Environment* in the Finnish and English groups. Similarly, *Atmosphere*, *Spirituality, and Peaceful* are notably higher than their counterparts in other groups. This can be due to the Japanese idea of beauty, where aesthetic experience is related to the holistic experience of the entire surrounding world (Saeki, 2001). These kinds of cultural tendencies, as well as individual differences, are important to take into consideration when designing a tool to capture people's wide perceptions of VN.

4.3 Multilingual Comparison

First, participants matched words across languages individually. After each of them had drawn their own map, they were encouraged to discuss their choices. Many participants pointed out that several word pairs do not carry equivalent meanings. Examples: "Aistillisuus & beautiful doesn't necessarily match in my mind." (P8); "Strange & 畏怖, meaning a bit different." (P15); "nostalgic & 郷想, maybe 懐かしい suit better?" (P17). This outcome suggests

that although the preliminary vocabulary developed during earlier workshop sessions was carefully considered and internally coherent for the original participants, the underlying rationale did not transfer to the new groups. For instance, the set Aistillisuus / きれい / Beautiful does not represent a direct translation sequence but rather an interpretive alignment of meaning, which was not immediately evident to the subsequent participants. Also, some words were viewed as too abstract or too broad, making interpretation difficult, e.g. “Ilmapiiri (atmosphere) can also be an emotional word.” (P13); “With each word, I think about the ambiguity of the word and its meaning to me.” (P10). Participants recognise that several terms carry layered meanings, which may not be stable across users or cultures. These findings indicate the need to refine the vocabulary so that all terms form a coherent conceptual domain and are easily interpreted across languages. Simplifying the terminology by avoiding rare words, complex kanji, and terms with multiple meanings, and favouring adjectives over nouns may help unify meaning across languages.

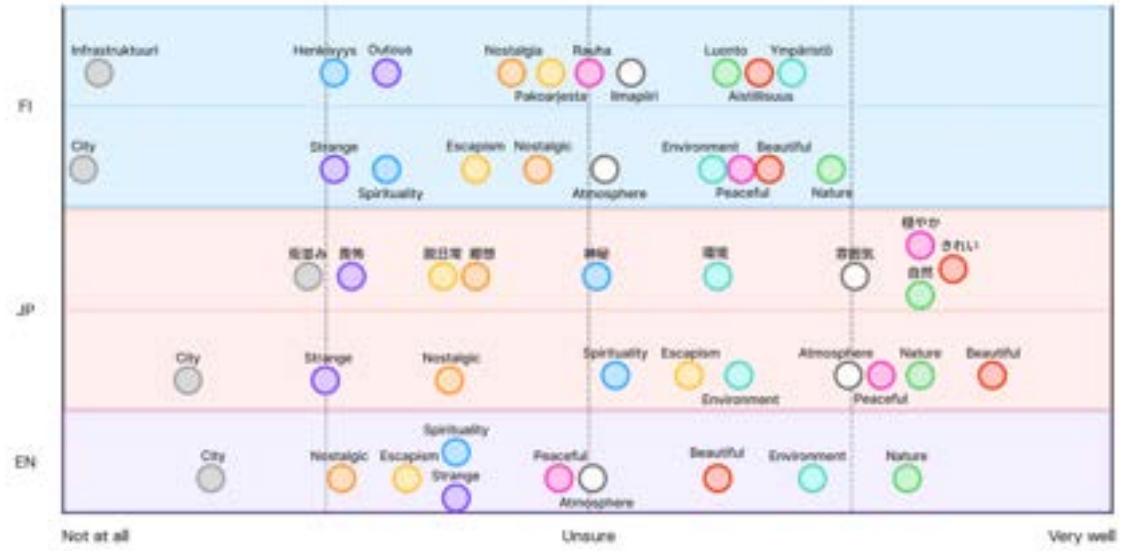

Figure 1. Average ratings of the descriptive accuracy of the words across languages.

4.4 Survey

Figure 2 presents a scatterplot illustrating the ratings of the words in each language by their *Descriptiveness* and *Emotional Connection*. Similarly to the mapping of the words in the Experience Reflection task, it can be seen that a group of Japanese words has higher ratings in descriptiveness: 自然 (Nature), 穏やか (Peaceful), きれい (Beautiful), 雰囲気 (Atmosphere), 環境 (Environment). Whereas Infrastruktuuri and 街並み (City) stay as the least descriptive.

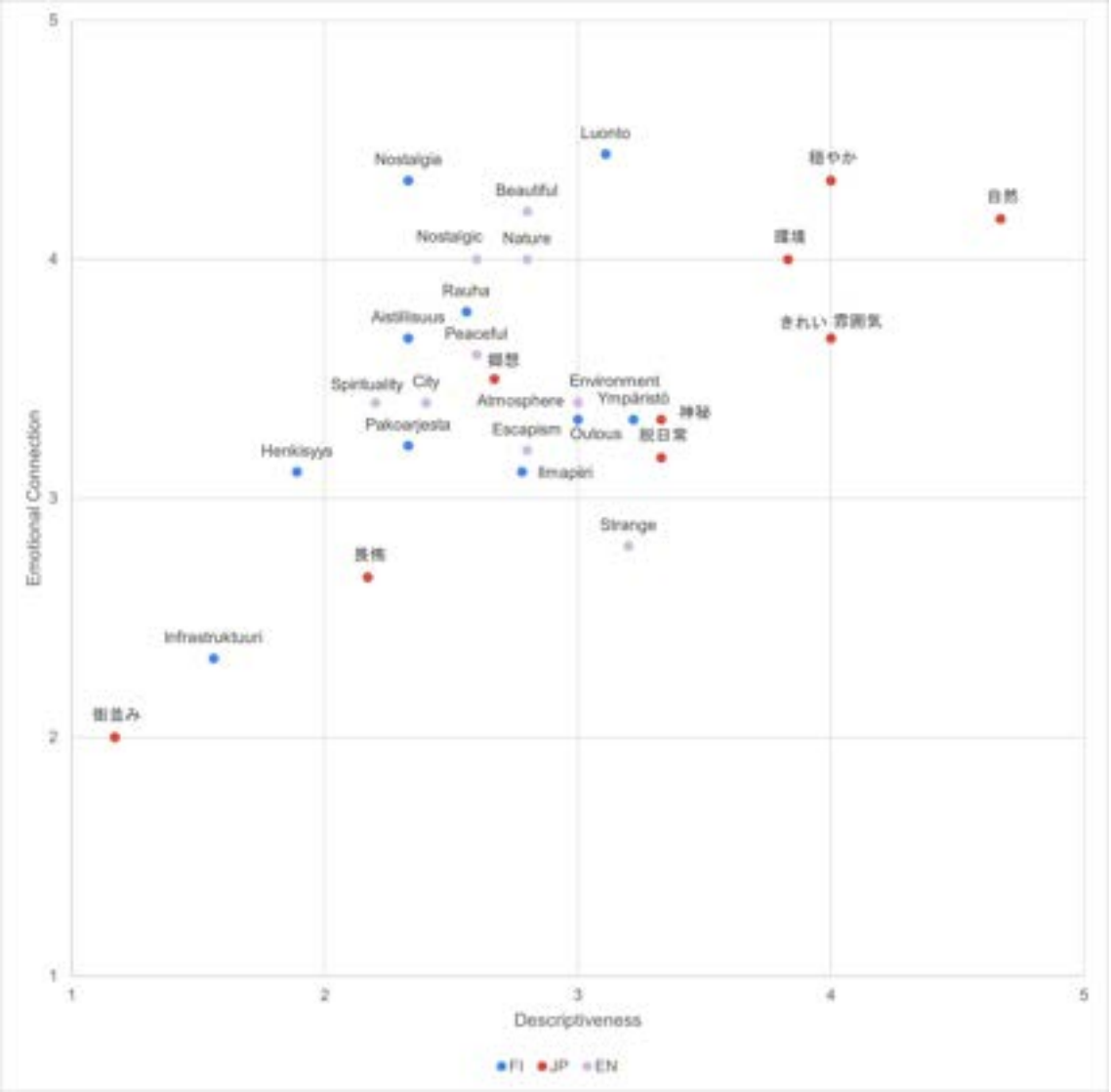

Figure 2. A scatterplot illustrating the ratings of the words in each language by their Descriptiveness and Emotional Connection

Wilcoxon signed-rank tests were conducted for each Kansei word to compare participants' paired Descriptiveness and Emotional Connection ratings. Before correction for multiple comparisons, significant differences were observed for Nature ($Z = -2.280$, $p = .023$), Peaceful ($Z = -3.082$, $p = .002$), City ($Z = -2.675$, $p = .007$), Nostalgic ($Z = -3.335$, $p < .001$), Spirituality ($Z = -2.113$, $p = .035$), and Beautiful ($Z = -2.257$, $p = .024$). No significant differences were found for Strange ($p = .487$), Environment ($p = .563$), Atmosphere ($p = .670$), and Escapism ($p = .246$). After applying the Holm correction for multiple comparisons, only *Peaceful* and *Nostalgic* remained statistically significant. The results suggest that VNE-specific ratings did not always align with participants' broader associations with the Kansei terms, highlighting the importance of careful vocabulary selection and validation in multilingual evaluation tools.

5 DISCUSSION

This study explored participants' interpretations of the preliminary VN vocabulary. The discussion reviews the main findings, limitations, and future research directions.

5.1 Word Associations Across the Languages

Luonto / 自然 / *Nature:* Across languages, associations with Nature most commonly referenced greenery, forests, trees, and plants. Silence and peace were frequently mentioned experiential qualities, while home, life, animals, and the environment also appeared, showing that nature was understood as both a physical and emotionally grounding domain. *Outous* / 畏怖 / *Strange:* Associations with Strange centred on fear and curiosity, reflected in repeated terms such as scary and interesting. Words like strange, nature, and animals suggest that unfamiliar or ambiguous environments, often tied to natural elements, were experienced as attention-capturing or unsettling. *Rauha* / 穏やか / *Peaceful:* Responses emphasised tranquillity, natural elements (sky, wind, snow, rain, forest), and states of mental calmness. Feelings of safety and home were also prominent, indicating that peacefulness combined environmental serenity with emotional security and groundedness. *Infakstuuri* / 街並み / *City:* Associations with City focused on built structures (homes, buildings, streets) and urban features such as traffic, cars, and noise. Social themes: people, crowds, homelessness, highlighted human dynamics within cities. Everyday contrasts such as good coffee, history, and Tokyo illustrated diverse urban experiences. *Nostalgia* / 郷想 / *Nostalgic:* Nostalgic showed the most consistent meaning across languages. Associations centred heavily on childhood memories, including play, TV shows, music, films, Gameboy, and photographs. Warmth, home, and summers at the cottage highlighted positive memories. These patterns align with research showing that memories are multisensory (Murray et al., 2004) and that scent can evoke particularly vivid recollections (Verbeek & van Campen, 2013). *Henkisyys* / 神秘 / *Spirituality:* Associations with Spirituality revolved around beliefs, experiences, and personal narratives. Nature, soul, religion, and meditation were recurring terms, suggesting that spirituality was linked to meaning-making, introspection, and transcendent or natural elements. *Ympäristö* / 環境 / *Environment:* Responses were dominated by nature-related words and everyday links to environmental contexts. Participants referenced a wide range of settings: city, streets, trees, soil, sea, forest, alongside broader societal and ecological terms such as climate, pollution, and planet, indicating awareness of environmental and global issues. *Aistillisuus* / きれい / *Beautiful:* Associations with Beautiful centred on aesthetic and emotional qualities, including sensitivity, nature, and expressions such as "something that moves the heart". Beauty was perceived through both affective resonance and natural imagery. *Ilmapiiri* / 雰囲気 / *Atmosphere:* Participants associated Atmosphere with mood and experiential ambience, using terms such as feeling and vibe. Air-related and spatial terms (air, space, sky) suggested that atmosphere was understood through both emotional tone and physical qualities of openness. *Pakoarjesta* / 脱日常 / *Escapism:* Associations highlighted nature, silence, and tranquillity as forms of retreat. Leisure and entertainment, fantasy, TV series, games, and adventure were common pathways for escape, while terms like doomscrolling and escape from reality reflected psychological withdrawal and coping. Overall, the associations illustrate that emotional and semantic interpretations of VN vocabulary are shaped by both shared human experiences and

language-specific cultural frames, underscoring the need for multilingual validation in affective terminology development.

5.2 Emotional Salience vs. Descriptive Accuracy

The results indicate that emotional connection does not consistently align with descriptiveness in VN terminology. Word sets such as Peaceful and Nostalgic showed significant differences between emotional connection ratings and descriptive ratings. This suggests that participants' broader associations with these words may not always align with how well they describe the VNE, highlighting the need for measurement tools that capture both dimensions. Previous cross-linguistic analyses have shown that emotional meanings can vary substantially across languages, reflecting differences in how emotions are categorised and expressed (Sadiqzade, 2025). While the present study did not directly test linguistic differences, these findings highlight the importance of validating multilingual Kansei vocabularies across language contexts. When developing scales for emotional perception of VN, incorporating items that represent emotional impact alongside descriptive clarity may provide a more accurate representation of user experience.

5.3 Cultural Variability in Affective Interpretation

Participants' discussions highlighted that the interpretive logic behind the original vocabulary did not readily transfer to new groups: terms such as *Aistillisuus* / きれい / *Beautiful* were not recognised as parallel in meaning. These reactions reflect broader challenges across languages in representing subjective experience. As prior research shows, emotional perception and expression are shaped by cultural norms, leading to systematic differences in how meanings are interpreted (Scherer et al., 2011). People often rely on intersubjective expectations, beliefs about how others typically feel, rather than on their own preferences (Chiu et al., 2010), and attitudes themselves vary across cultures in how personally or socially anchored they are (Riemer et al., 2014). Consequently, these insights reinforce the importance of carefully selecting and validating multilingual Kansei vocabularies and support the development of a Kansei evaluation tool that addresses variation in affective interpretation in the VN context.

5.4 Study Limitations and Future Work

Although limited by a modest sample size, this exploratory and participatory study provides useful insights for developing tools to evaluate nature experiences. As the descriptiveness and emotional connection questions differed in both focus and context, observed differences should be interpreted cautiously. The study was also not designed to directly test linguistic or cultural differences. Future work will refine and validate the Kansei vocabulary and develop a culturally responsive Kansei Evaluation Tool for use in immersive VR and real-world nature settings.

6 CONCLUSION

This study showed that people from different language backgrounds interpret Kansei words in the VN context through both shared experiences and individual variation. Differences were observed between how certain words described the VNE and participants' broader emotional

associations with them. These findings highlight the importance of carefully selecting and validating multilingual Kansei vocabularies for evaluation tools. Although exploratory, the study raises important questions about multilingual Kansei scale design and provides direction for developing a culturally responsive Kansei Evaluation Tool. Future work will refine the vocabulary and test it in immersive VR and real-world environments to better capture emotional and sensory responses to VNE.

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