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Interaction Augmentation:

Deepening User Experience to Build Placeness

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Human-place relationship

Scannell and Gifford (2010)

The cognitive connections that constitute place attachment from a personal perspective, such as emotional affection for a location and the perceived significance it holds.

Lewicka(2011)

Even in a highly mobile modern society, people continue to develop strong attachments to particular places.

Gustafson(2001)

Analyzed the relationship between place attachment and mobility

Human-product relationship

Mugge(2009)

Many products that interact with humans primarily aim for practicality, but they are also expected to pursue social value in the process and provide users comfort and enjoyment through product use.

Alabed, Javornik, & Gregory-Smith(2022)

The interaction characteristics of products significantly affect human behavior.

Li (2023)

Interaction-based cues have a greater impact on consumers' buying decisions.

Gap :

The lack of research on the relationship between product interaction and placeness

Core question :

Does product interaction contribute to the formation of memory and meaning associated with a space?

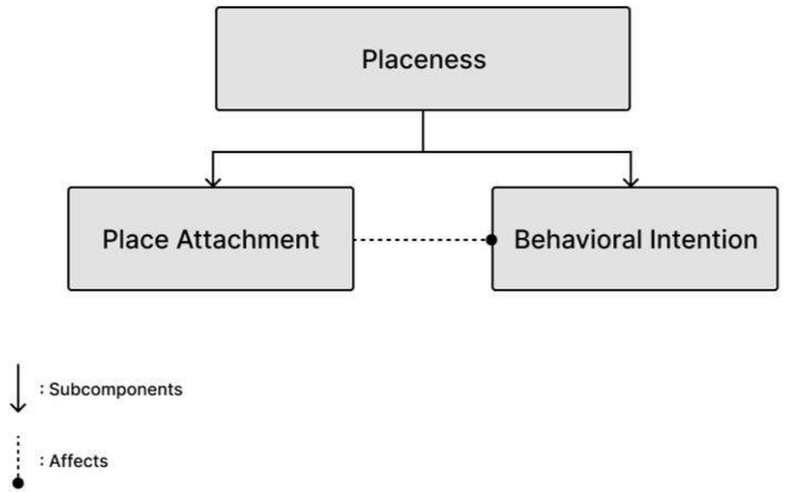
Placeness

Placeness refers to the emotional and cognitive bonds formed through interactions with specific locations, shaped by the accumulation of personal memories and experiences.

Place attachment is a critical subcomponent of placeness.

(Vaske and Kobrin (2001))

Placeness is influenced by individuals' memories and emotional experiences associated with certain locations, which in turn contribute to the development of place attachment.



place attachment affects behavioral intentions.

(Halpenny (2010))

It found that individuals with strong place attachment were more inclined to protect the location, recommend it to others, and revisit it in the future.

Micro-interaction

- Execution of small product functions
- Ex) pressing a switch, turning a door handle

Interaction Augmentation

(proposed new concept)

- Adding expressions to functional micro-interactions
- Ex) Turning on a light + a nodding gesture as a greeting

What We Investigated

RQ1: Will users evaluate the lighting product with expressive movement more positively?

- H1: Users will perceive the anthropomorphized lighting product (W) as more organic, human-like, intelligent, and comfortable compared to the non-interactive version (W/O).

RQ2: Does the lighting product influence place attachment?

- H2: Users will associate the lighting interaction with the space, leading to emotional memory formation and comfort—stimulating the affective (A) aspect of placeness.

RQ3: Does the lighting product influence behavioral intention toward the place?

- H3: The lighting interaction will motivate users to revisit or invite others to the space—stimulating the intentional (I) aspect of placeness.

Interactive Lighting Design(RtD Methodology)

Form:

human-like silhouette with a hat

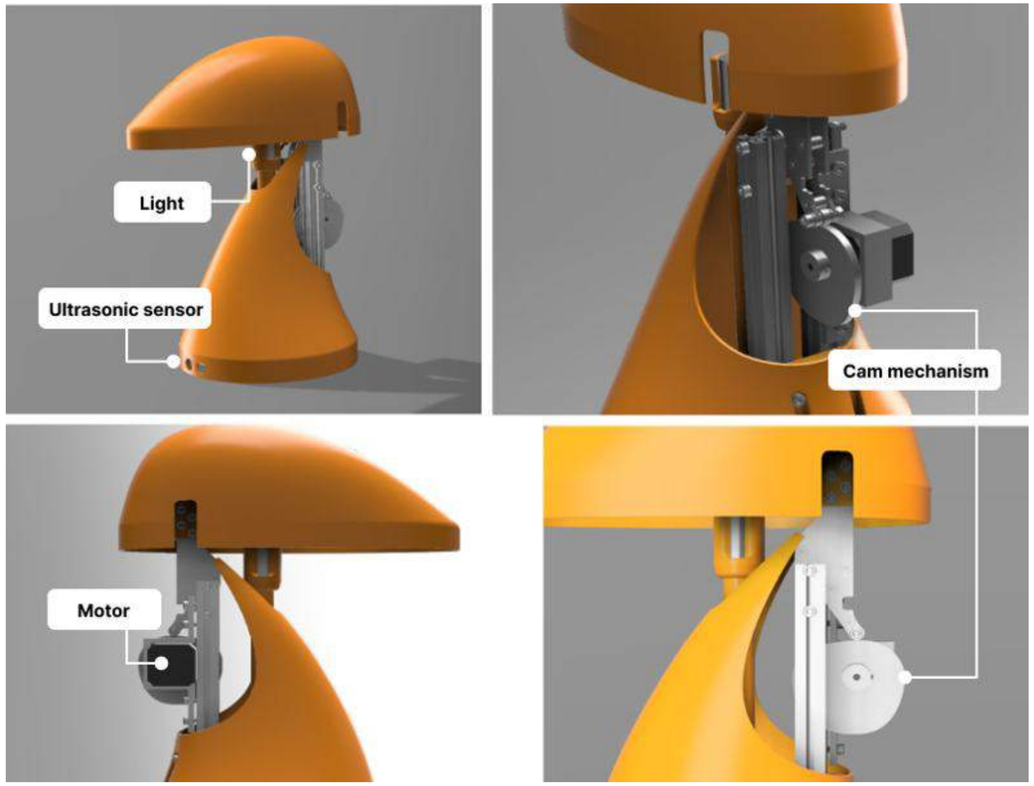
Motion exploration:

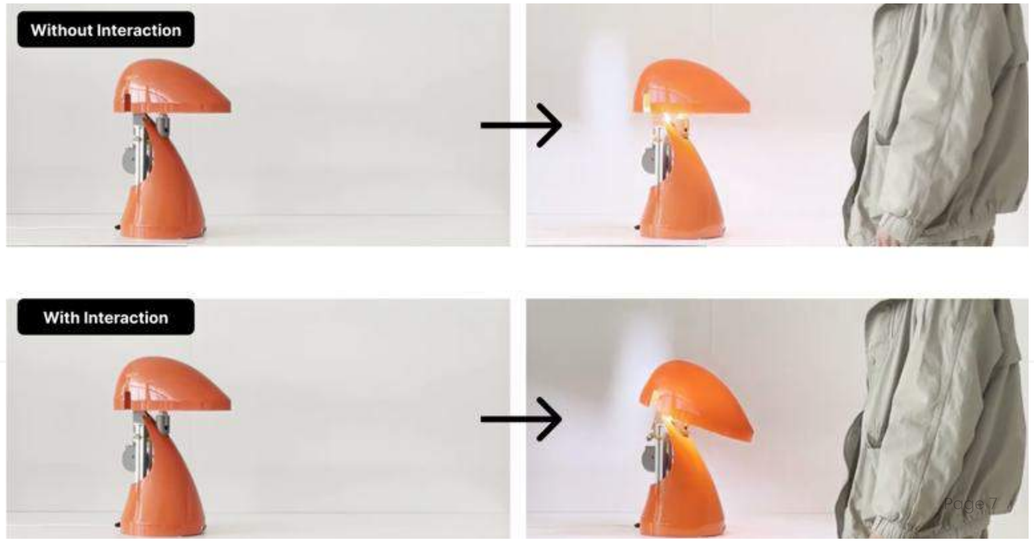
waving → bowing → nodding

Two Conditions:

W/O interaction: light turns on only

W interaction: light turns on + nodding motion (20° rotation)





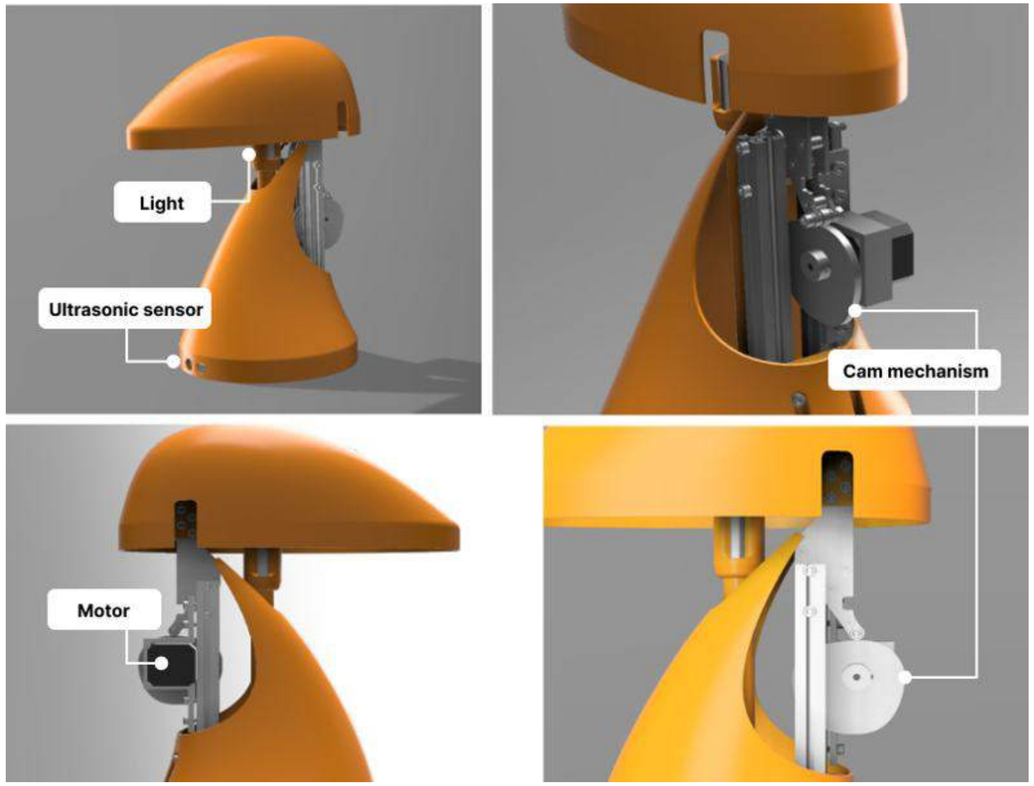
Video-based Experiment

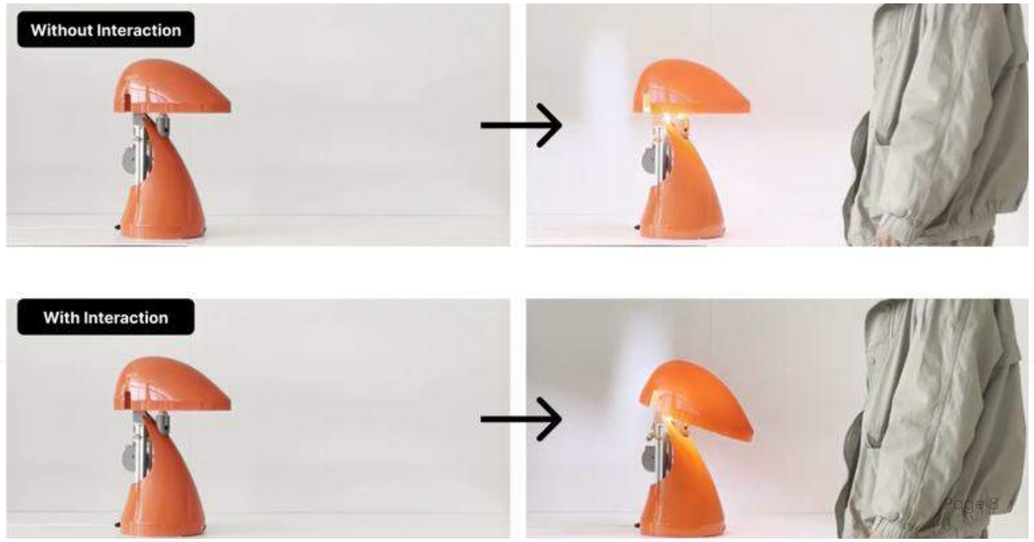
Participants:

N=54 (Male 28, Female 26)

Procedure:

1. **Participants watched two 8-second video clips (W/O vs W)**
   Then completed a questionnaire (7-point Likert scale)
2. **Measures:**
   - **Product characteristics: Godspeed Questionnaire (Organic, Lively, Appealing, Intelligent, Comfortable)**
   - **Place Attachment: 3 items**
   - **Behavioral Intention: 3 items**





H1 : Product Characteristics

Does Interaction Matter?

- The lighting product with the nodding motion (W) received higher ratings than the product without the movement (W/O).

- The fact that the “Lively” item showed the largest difference (Δ = 1.52) among the 5-factors indicates that **the movement itself directly contributes to the perception of liveliness**. The nodding motion served as the most salient cue that made participants perceive the product as a “living entity.”

- Supports H1: Interaction led to more positive evaluations in 4 out of 5 items.

Table 2. Product Characteristics Comparison

Product Characteristic	Difference	Significancy	P
Organic	0.80	Significant	0.0001
Lively	1.52	Significant	< 0.0001
Appealing	0.65	Significant	0.0056
Intelligent	1.28	Significant	< 0.0001
Comfortable	0.35	Not significant	0.0894

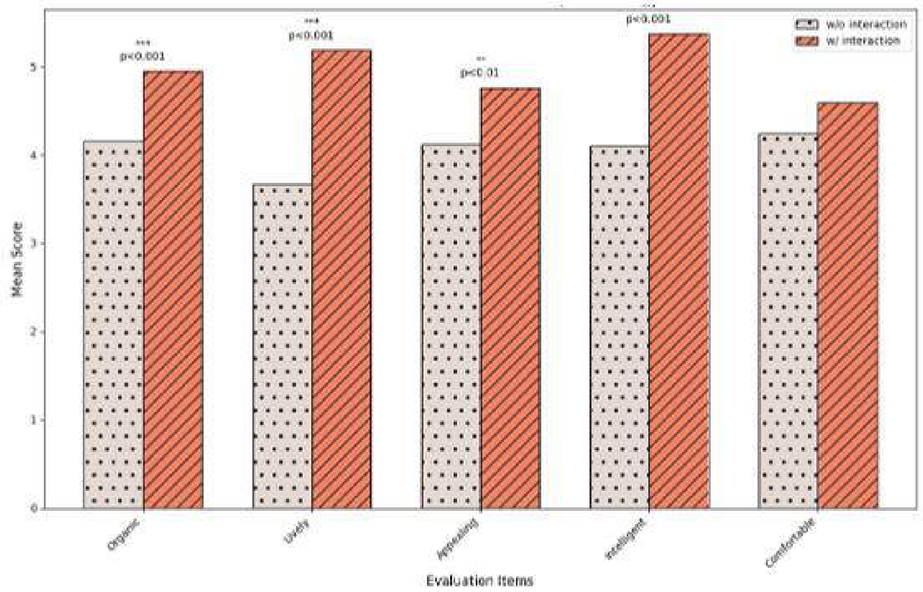


Figure 8. Product characteristics comparison

H2, H3 : Placeness

Does It Influence Placeness?

H2 (Place Attachment) - Partially Supported

1. Strong Effect on Memory Formation: Interaction augmentation had the greatest impact (Δ=1.54) on making spaces memorable. This indicates that **dynamic product behavior differentiates spatial experiences and strengthens cognitive imprinting**.

H3 (Behavioral Intention) - Fully Supported

1. Clear Pathway to Behavioral Change: All three behavioral intentions (positive mention, revisit, inviting others) showed strong effects ($p<0.0001$), confirming a **clear causal relationship between interaction augmentation and actual behavior**.

Integrated Insights

- Staged Influence: Cognition→Emotion→Behavior: A **structural pathway** was confirmed where interaction first creates memory (cognition), forms attachment (emotion), and ultimately leads to behavioral intention.

Table 3. Placeness Characteristics Comparison

Placeness Characteristic	Difference	Significancy	P
Memorable space	1.54	Significant	< 0.0001
Psychological comfort	0.33	Not significant	0.0599
Attachment to space	0.63	Significant	0.0036
Positive mention to others	1.00	Significant	< 0.0001
Willing to revisit	0.93	Significant	0.0002
Willing to invite others	1.00	Significant	< 0.0001

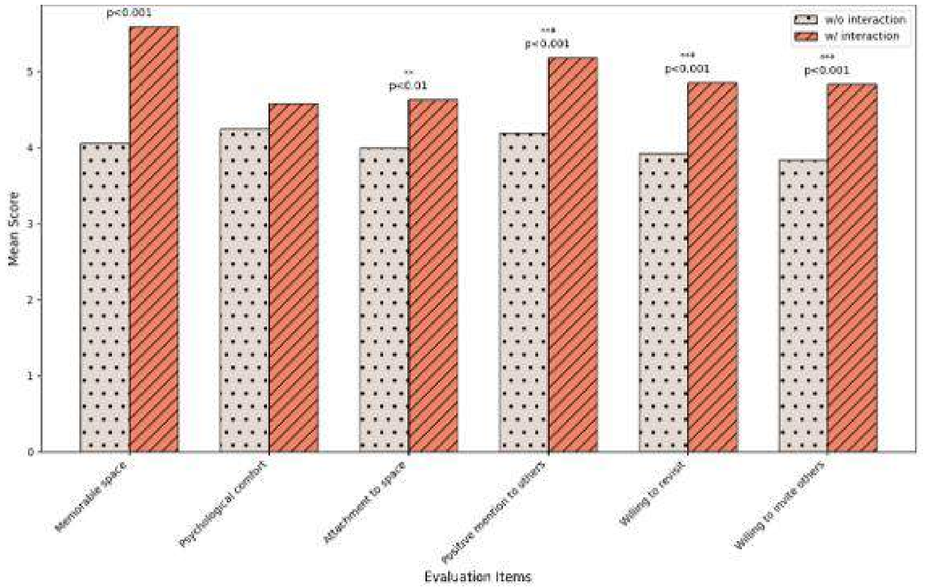


Figure 9. Place Characteristics Comparison

Key Correlations

What Drives Placeness?

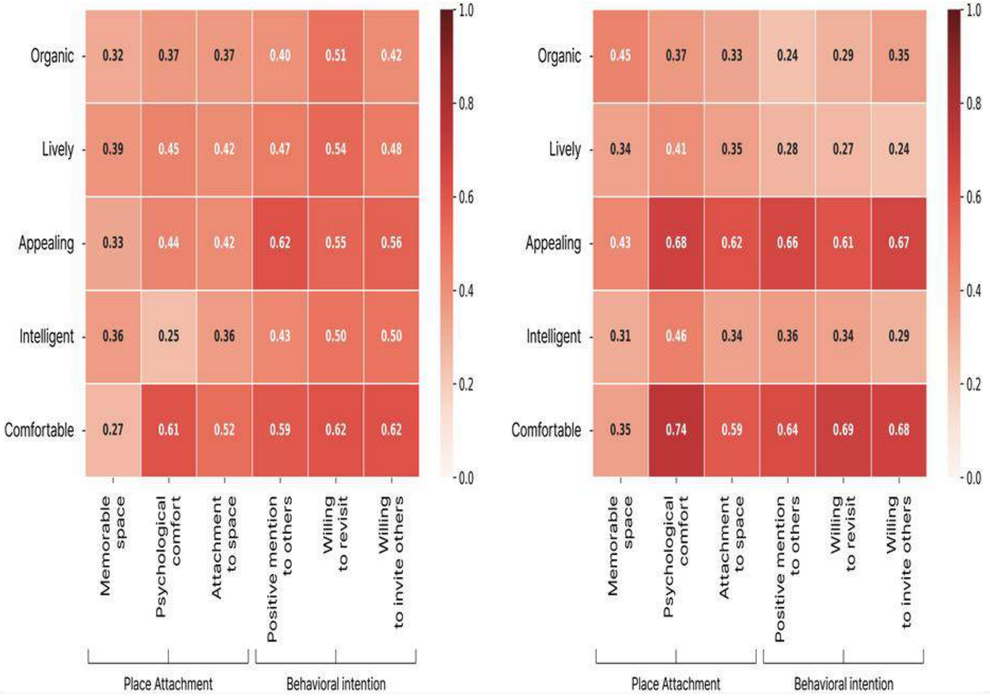
Strongest correlations (Table 4):

- Comfortable <-> Psychological comfort (r = 0.737)
- Comfortable <-> Willing to revisit (r = 0.694)
- Appealing <-> Psychological comfort (r = 0.690)
- Comfortable/Appealing <-> Willing to invite others

→ "Comfortable" and "Appealing" emerge as the core affective factors in the formation of placeness.

Table 4. W/O & W interaction: By highest correlation

Correlation of Characteristics and Space Experience		r	p-value
Because of product W, this space will give me psychological comfort	↔ Comfortable	0.737	< 0.0001
Because of product W, I want to revisit this place	↔ Comfortable	0.694	< 0.0001
Because of product W, this space will give me psychological comfort	↔ Appealing	0.690	< 0.0001
Because of product W, I want to invite others to this space	↔ Comfortable	0.682	< 0.0001
Because of product W, I want to invite others to this space	↔ Appealing	0.670	< 0.0001



Preference Analysis

Who Wants This Product?

70.4% indicated willingness to install the product in their own space.

Group differences between the Yes vs. No groups :

- Product: Appealing (Δ = 1.88), Comfortable (Δ = 1.55)
- Placeness: Willing to invite others (Δ = 2.25), Attachment (Δ = 1.96)

→ "Appealing" and "Comfortable" are the key predictors of actual purchase/installation intention.

Table 5. Largest Differences in 'With Interaction(W) Product' Characteristics Between 'Yes' and 'No' Respondents

Product Characteristic	Difference	Significancy
Appealing	1.88	Significant
Comfortable	1.55	Significant
Organic	0.63	Not significant

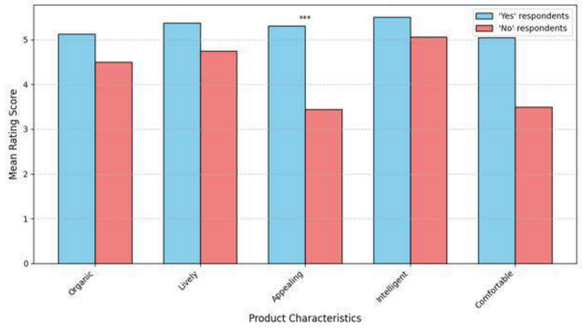
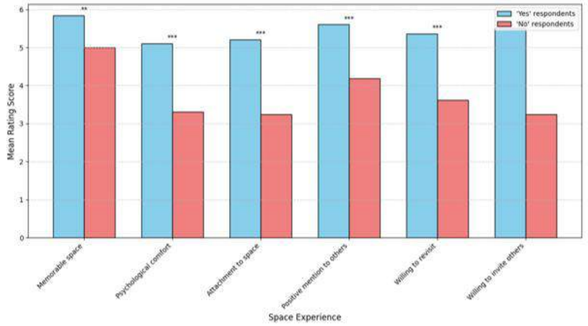


Figure 11. Comparison of 'With Interaction(W) Product' characteristics by preference

Table 6. Largest Differences in 'Placeness' Characteristics Between 'Yes' and 'No' Respondents

Placeness Characteristic	Difference	Significancy
Willing to invite others	2.25	Significant
Attachment to space	1.96	Significant
Psychological comfort	1.79	Significant



SEM Analysis - Place Attachment as Mediator

How Does It Work?

Key pathways:

- Product Characteristics → Place Attachment: β = 0.701
- Place Attachment → Behavioral Intention: β = 0.905 (very strong)
- Place Attachment → Preference: β = 0.621

Mediation Effect:

- Direct effect: 0.629
- Indirect effect (via Place Attachment): 0.634
  → Place attachment is the central mediating variable.

Most influential attributes (Table 9):

- Appealing (β = 0.682)
- Comfortable (β = 0.661)

Product Characteristic	Path Coefficient with Place Attachment
Appealing	β = 0.682
Comfortable	β = 0.661
Organic	β = 0.432
Lively	β = 0.422
Intelligent	β = 0.432

The fact that the **indirect effect (0.634) is slightly larger** than the direct effect (0.629) indicates that product characteristics exert a stronger influence on behavioral intention when **mediated by place attachment**.

(This result aligns with the conclusion of Dalavong & Im (2024), who stated that “placeness does not directly affect behavioral intention, but rather exerts its influence indirectly through place attachment.”)

→ The analysis indicates that place attachment functions as an important mediating pathway in the relationship between product characteristics and behavioral intention.

Qualitative Insights

Reasons for positive evaluations:

- “It feels almost alive, which makes it fun.”
- “If the movement were softer and more fluid, I would feel more attached to it.”

Negative evaluations & suggestions for improvement:

- “The color may not match my furniture.”
- “It lacks a sense of friendliness.”
- “The feeling of comfort would vary depending on where it is installed.”

→ **The refinement of motion, harmony with furniture, and spatial context are crucial factors.**

What Did We Learn?

1. **Proposing the Concept of Interaction Augmentation**
   - From functional micro-interaction → to emotional augmentation

2. **Identifying the Pathway of Placeness Formation**
   - Product → Place Attachment → Behavioral Intention

3. **Design Strategy**
   - Focus on Appealing & Comfortable
   - Refinement of motion and spatial harmony required

4. **Theoretical Contribution**
   - Presenting a new direction for research on product-space relationships

Limitations & Future Work

1. **Methodological Limitations:**
    - 8-second video → Difference from actual spatial experience
    - Absence of clear spatial context (entryway vs. living room)
    - RtD process focused on motion > CMF

2. **Future Research:**
    - Longitudinal study
    - Comparison of diverse product types and spatial contexts
    - Systematic iteration on CMF

Conclusion

1. **For Designers:**
    - Augmenting micro-interactions can enhance spatial experiences
    - Strategic investment in Appealing & Comfortable emotional elements
    - Design products within spatial contexts, not in isolation

2. **For Researchers:**
    - Empirical validation of the product interaction → placeness pathway
    - Confirmation of place attachment's mediating role
    - Potential for interdisciplinary research (design + environmental psychology)

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For additional questions, please contact me via email.
I'll provide thoughtful · accurate responses after careful consideration."

Thank You

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