

Impacts of Agricultural Experiential Spaces in Rice Field Parks on Children's Perceived Friendliness: A Case Study of Taiyuan, Shanxi, China

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Abstract Although rice field parks have emerged as innovative urban public spaces integrating agriculture, ecology, and education, limited research has examined how their experiential spaces influence children's perception of friendliness, particularly through psychological mechanisms such as nature connectedness. This study aims to investigate the impact of agricultural experiential spaces on children's perceived friendliness, using Taiyuan Rice Field Park in Shanxi Province, China, as a case study. This research adopts a mixed-method design, grounded in child-friendly theory and environmental behaviorology and nature connectedness theory. A main survey is administered to 350 children aged 3–15 who visit Taiyuan Rice Field Park, measuring their perceptions of the agricultural landscape, cultural significance, and immersive participation, as well as their level of nature connectedness and perceived friendliness of the space. Quantitative data are analyzed using SPSS v.28.0 and AMOS v.28.0 for SEM. The quantitative strand is complemented by semi-structured interviews with 15 participants, including children, parents, and park managers, to gain qualitative insights into children's psychological and emotional experiences in the park.

The results show that agricultural landscape perception ($\beta = 0.42, p < 0.001$), cultural significance perception ($\beta = 0.38, p < 0.001$), and immersive participation ($\beta = 0.51, p < 0.001$) all significantly enhance nature connectedness, which in turn fully mediates the relationship with perceived friendliness ($\beta = 0.68, p < 0.001$). Immersive participation exerts the strongest total effect. These findings provide empirical evidence and practical guidance for optimizing child-friendly agricultural parks and supporting broader child-friendly city development.

Keywords: Agricultural Landscape Perception, Cultural Significance Perception, Immersive Participation, Nature Connectedness, Perceived Friendliness.

1. INTRODUCTION

In the context of global urbanization moving towards more qualitative and people-oriented development, child-friendly cities have become the core direction of sustainable urban construction. Urban parks, as important spaces for children to interact with nature, engage in exploration, and grow socially, have design quality that directly affects children's physical and mental development. The rice field park, which integrates agricultural production, ecological leisure, science education, and parent-child activities, has rapidly emerged in recent years. It not only meets citizens' needs for natural experiences but also provides a new path for urban ecological restoration and public space innovation.

Taiyuan Rice Field Park is a representative urban agricultural landscape park in Shanxi Province, covering 1,272 acres, with approximately 600 acres dedicated to rice cultivation. It integrates agricultural education, parent-child play, and rural leisure, receiving

about 1.8 million visitors annually, nearly 40% of whom are children. It is an important natural education and parent-child leisure landmark in the region. The Park has created diverse experience scenarios based on rice field ecology and conducts seasonal agricultural and recreational activities, possessing a strong ecological and cultural foundation.

However, from a child-friendly perspective, significant deficiencies remain in the park's experiential space. Design is mostly oriented towards adult perspectives and tourism development, with insufficient attention to children's behaviors, sensory needs, and psychological needs. Spatial layout, facility configuration, circulation organization, and cultural display have not been fully adapted to the physical and mental characteristics of children aged 3–15, resulting in insufficient facility adaptability, weak cultural interaction, and inadequate cultivation of immersive experiences and emotional connections. These issues make it

3. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

This study adopts a mixed-method design combining a quantitative questionnaire survey and qualitative semi-structured interviews. The quantitative part uses structural equation modeling (SEM) to test hypotheses and verify the conceptual framework. The qualitative part conducts semi-structured interviews with 15 participants to provide contextual insights and improve the validity and reliability of the research findings.

3.2 PILOT STUDY

Before the main survey, a pilot study was conducted to test the reliability and validity of the questionnaire. A total of 96 valid responses were collected from children aged 3–15 visiting Taiyuan Rice Field Park. The pilot study results showed good internal consistency (Cronbach's $\alpha > 0.83$ for all dimensions) and structural validity (KMO = 0.721, cumulative variance explained = 62.72%). Based on the pilot study, minor wording adjustments were made to three items to improve clarity for younger children.

3.3 MAIN STUDY DESIGN

3.3.1 POPULATION AND SAMPLE

The target population was children aged 3–15 years who had visited Taiyuan Rice Field Park in Shanxi Province, China. Using stratified random sampling by age group (preschool 3–6, school age 7–12, early adolescence 13–15), questionnaires were distributed across multiple visits to the park during weekends and holidays.

A total of 420 questionnaires were distributed, and 350 valid responses were obtained, representing an effective response rate of 83.3%. The sample size exceeds the minimum requirement of 200 for SEM (Kline, 2016) and satisfies the 10-times rule for PLS-SEM (Hair et al., 2019).

Prior to formal distribution, the questionnaire was pretested among a small group of child respondents and their accompanying guardians to assess clarity, logical coherence, and completion time. Minor revisions were made to wording and item order to improve comprehensibility for younger participants.

Table 1. Demographic characteristics of the main sample (N=350)

Variable	Category	Frequency	Percentage (%)
Gender	Male	178	50.9
	Female	172	49.1
Age	3–6 years	56	16.0
	7–12 years	238	68.0
	13–15 years	56	16.0
Visit frequency	First time	168	48.0
	1–2 times	98	28.0
	3–5 times	56	16.0
	>5 times	28	8.0
Visit duration	<2 hours	63	18.0
	2–5 hours	175	50.0
	Half day or more	112	32.0

3.3.2 MEASURES

All constructs used validated scales from existing literature, slightly modified for the context of rice field parks in Shanxi. Respondents (children with parental assistance for younger age groups) rated items on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

Agricultural Landscape Perception (5 items; $\alpha = 0.87$): Adapted from Zhang & Li (2022) and Wang (2023), measuring sensory evaluation of natural scenery.

Cultural Significance Perception (4 items; $\alpha = 0.88$): Measuring recognition and understanding of agricultural culture and educational value.

Immersive Participation (5 items; $\alpha = 0.89$): Assessing level of engagement in hands-on agricultural activities and interactive games.

Nature Connectedness (5 items; $\alpha = 0.90$): Adapted from Mayer & McPherson (2021) and Cao et al. (2024), measuring emotional bond with nature.

Perceived Friendliness (5 items; $\alpha = 0.86$): Adapted from UNICEF (2022), measuring children's evaluation of safety, comfort, and suitability.

Construct validity was confirmed by confirmatory factor analysis (CFA); all items loaded significantly on their intended constructs, and the measurement model showed good fit (CFI = 0.94, RMSEA = 0.058).

3.3.3 DATA COLLECTION PROCEDURE

Questionnaires were distributed on-site by trained investigators with standardized guidance. For children under 7 years old, parents provided assistance in reading and recording answers. Participation was voluntary, and completion time was controlled at 10–12 minutes.

Semi-structured interviews were conducted with 15 participants: 8 children (aged 7–15), 5 parents, and 2 park operation managers. The interviews focused on children's favorite spaces and activities, agricultural participation experiences, cultural perception, safety and comfort concerns, and suggestions for improvement. With informed consent, interviews were recorded and transcribed for thematic coding analysis.

3.3.4 DATA ANALYSIS

Quantitative data were analyzed using SPSS v.28.0 for descriptive statistics, reliability, and validity tests. AMOS v.28.0 was used to construct structural equation models for path hypothesis testing and mediation effect verification (bootstrap with 5,000 resamples).

Common Method Bias Test: Given that all data were collected from children's self-reports (with parental assistance for younger children), Harman's single-factor test was conducted to assess the risk of common method variance (CMV). The unrotated exploratory factor analysis revealed that the first factor accounted for 26.8% of the total variance, which is below the recommended threshold of 50% (Podsakoff et al., 2003). This indicates that common method bias is not a significant concern in this study.

Qualitative data from semi-structured interviews were analyzed using thematic coding (Braun & Clarke, 2006), which was then cross-validated with quantitative results.

3.3.5 ETHICAL CONSIDERATIONS

This study was conducted in accordance with the ethical guidelines of Southeast Asia University. Parental informed consent was obtained for all child participants. Participants were informed of their rights, including voluntary participation, anonymity, and the ability to withdraw at any stage. Data were anonymized prior to analysis and stored securely.

4. RESULTS

4.1 DESCRIPTIVE STATISTICS

Children generally rated all dimensions positively. Immersive participation had the highest mean ($M = 4.12$, $SD = 0.78$), followed by agricultural landscape perception ($M = 4.05$, $SD = 0.82$), nature connectedness ($M = 4.01$, $SD = 0.79$), perceived friendliness ($M = 3.95$, $SD = 0.85$), and cultural significance perception ($M = 3.88$, $SD = 0.84$). Skewness and kurtosis values were within acceptable ranges for normal distribution.

4.2 RELIABILITY AND VALIDITY

All constructs demonstrated excellent reliability. Composite reliability (CR) ranged from 0.86 to 0.90, exceeding the threshold of 0.70. Convergent validity was confirmed, with average variance extracted (AVE) ranging from 0.67 to 0.75 (all > 0.50). Discriminant validity was supported by the Fornell-Larcker criterion: the square root of AVE for each construct exceeded its correlation with any other construct.

4.3 MODEL FIT

The structural equation model achieved good overall fit. All indices met or exceeded recommended criteria: CMIN/DF = 2.34 (≤ 3), GFI = 0.91 (> 0.90), CFI = 0.94 (> 0.90), RMSEA = 0.058 (< 0.08). These results validate the rationality and stability of the proposed framework.

Table 2. Correlations and discriminant validity (N=350)

Construct	CR	AVE	1	2	3	4	5
1. Agricultural Landscape Perception	0.87	0.68	0.82				
2. Cultural Significance Perception	0.88	0.70	0.58	0.84			
3. Immersive Participation	0.89	0.72	0.62	0.55	0.85		
4. Nature Connectedness	0.90	0.75	0.68	0.60	0.71	0.87	
5. Perceived Friendliness	0.86	0.67	0.59	0.54	0.65	0.74	0.82

Note: Diagonal values (bold) are the square roots of AVE; off-diagonal values are correlations.

4.4 HYPOTHESIS TESTING

All five hypotheses were supported.

Direct Effects:

H1: Agricultural landscape perception positively affects Nature connectedness ($\beta = 0.42$, $p < 0.001$)

H2: Cultural significance perception positively affects Nature connectedness ($\beta = 0.38$, $p < 0.001$)

H3: Immersive participation positively affects Nature connectedness ($\beta = 0.51$, $p < 0.001$)

H4: Nature connectedness positively affects Perceived friendliness ($\beta = 0.68$, $p < 0.001$)

Immersive participation exerted the strongest effect on nature connectedness,

followed by agricultural landscape perception and cultural significance perception.

Mediating Effect (H5): Bootstrap analysis (5,000 resamples) confirmed that nature connectedness fully mediated the relationships between all three independent variables and perceived friendliness. The indirect effects and 95% confidence intervals are presented in Table 3.

These results indicate that nature connectedness acts as a critical psychological bridge, through which agricultural landscape perception, cultural significance perception, and immersive participation collectively shape individuals' perceived friendliness toward the agricultural experience space.

Table 3. Mediating effect test results (bootstrap)

Path	Indirect Effect ($\beta_1 \times \beta_4$)	95% CI	Effect Type
Agricultural Landscape Perception $\rightarrow$ Nature Connectedness $\rightarrow$ Perceived Friendliness	0.2856	[0.214, 0.358]	Significant (Full mediation)
Cultural Significance Perception $\rightarrow$ Nature Connectedness $\rightarrow$ Perceived Friendliness	0.2584	[0.186, 0.330]	Significant (Full mediation)
Immersive Participation $\rightarrow$ Nature Connectedness $\rightarrow$ Perceived Friendliness	0.3468	[0.268, 0.426]	Significant (Full mediation)

*Note: Indirect effects calculated as $0.42 \times 0.68 = 0.2856$, $0.38 \times 0.68 = 0.2584$, $0.51 \times 0.68 = 0.3468$. *

4.5 QUALITATIVE FINDINGS

Semi-structured interviews with 15 participants (8 children, 5 parents, 2 park managers) were analyzed using thematic coding. Four main themes emerged.

Theme 1: "The rice fields make me feel free and happy" (Nature connectedness) – Most children expressed strong positive emotions about the natural environment. "I like running between the rice fields. The sound of water and insects makes me feel like I'm in a different world" (Child, male, 10). "My daughter talks about the rice planting experience for weeks

after our visit. She feels a real connection to the land" (Parent, female, 38).

Theme 2: "Doing things with my hands is the best part" (Immersive participation) – Children consistently valued hands-on activities over passive viewing. "Planting rice was hard but fun. I learned that farmers work very hard" (Child, female, 12). "The mud fight activity was the most memorable. I wish there were more things like that" (Child, male, 9). Parents echoed this: "When children actually do something, not just watch, they remember it much longer" (Parent, male, 42).

Theme 3: “I don’t really understand the cultural displays” (Cultural significance perception) – Several children found static cultural exhibits unengaging. “There are some signs and old tools, but they are boring. I just walked past them” (Child, male, 11). “The rice culture museum has a lot of words. Children don’t read that much” (Parent, female, 35). Park managers acknowledged this gap: “We know the cultural education part needs more interactive design, but we are limited by budget and space” (Manager, male, 45).

Theme 4: “Some places feel crowded and not safe for small kids” (Perceived friendliness) – Safety concerns were raised, particularly for younger children. “The popular activity areas get very crowded on weekends. My 4-year-old was almost pushed” (Parent, female, 34). “The pathways are not wide enough for strollers when many people are there” (Parent, male, 40). Managers noted ongoing improvements: “We are adding more rest areas and widening some paths based on visitor feedback” (Manager, female, 39).

These qualitative insights corroborate the quantitative findings: immersive participation strongly drives nature connectedness, cultural significance perception needs more child-friendly design, and safety concerns affect overall friendliness perceptions.

5. DISCUSSION

5.1 THEORETICAL IMPLICATIONS

This study makes several theoretical contributions to the fields of child-friendly environments, agricultural landscape design, and environmental psychology.

First, this study validates the applicability and effectiveness of the “agricultural landscape experience positively affects nature connectedness positively affects perceived friendliness” theoretical model in urban agricultural parks. It expands the application boundaries of child-friendly city theory (UNICEF, 2022, 2025) into agricultural landscape spaces, an area previously dominated by studies on conventional urban parks and playgrounds. The findings demonstrate that rice field parks, with their unique combination of natural elements, agricultural activities, and cultural heritage, offer distinct advantages for fostering children’s nature connectedness.

Second, this study confirms that nature connectedness plays a significant and full

mediating role between agricultural experiential dimensions and children’s perceived friendliness. This finding addresses a gap in previous research, which has primarily focused on spatial form design (e.g., path width, facility height, safety surfaces) while largely ignoring children’s psychological mechanisms and emotional responses. By demonstrating that agricultural experiences influence friendliness perceptions primarily through emotional bonding with nature, this study shifts attention from physical design alone to the psychological processes that mediate spatial experiences.

Third, the three-dimensional structure of agricultural experiential space—agricultural landscape perception, cultural significance perception, and immersive participation—provides a replicable and scalable evaluation framework for future research on urban agricultural parks, natural education sites, and rural leisure spaces. The strong effect of immersive participation ($\beta = 0.51$ on nature connectedness) suggests that hands-on, multi-sensory activities are more critical than passive viewing or static cultural displays.

Fourth, this study contributes to nature connectedness theory (Mayer & McPherson, 2021) by applying it to a novel context—urban rice field parks in China—and by demonstrating its mediating role in children’s spatial evaluations. The findings support the proposition that emotional bonds with nature are not merely outcomes of nature exposure but active psychological mechanisms that shape children’s perceptions of space quality and friendliness.

5.2 PRACTICAL IMPLICATIONS

Based on the integrated quantitative and qualitative findings, this study proposes four actionable strategies for enhancing child-friendliness in rice field parks and similar agricultural tourism spaces.

First, prioritize immersive, hands-on participation over passive viewing – The finding that immersive participation had the strongest effect on nature connectedness ($\beta = 0.51$) suggests that park managers and designers should invest in activity-based experiences rather than solely focusing on landscape aesthetics. Practical examples include rice planting, harvesting, mud play, straw crafting, and aquatic life observation. These activities should be offered regularly,

not only during festival periods, to maintain continuous engagement.

Second, redesign cultural interpretation from a child's perspective – The qualitative finding that children found static cultural exhibits "boring" and "hard to understand" indicates a need for child-centered cultural display. Instead of text-heavy signs and museum cases, parks should adopt interactive, gamified, and exploratory approaches: touchable models, audio stories, QR code-linked mini-games, and role-playing activities (e.g., "become a little farmer for a day"). The moderate effect of cultural significance perception ($\beta = 0.38$) suggests significant room for improvement in this dimension.

Third, enhance safety and comfort for children of all ages – The qualitative concerns about crowding, narrow pathways, and insufficient rest areas point to specific design improvements. Recommended actions include: widening main pathways to accommodate strollers, creating age-zoned activity areas (preschool, school age, early adolescence), adding shaded rest areas with child-sized benches, installing safety railings near water features, and managing visitor flow through timed entry or capacity limits during peak hours.

Fourth, strengthen long-term emotional connection through seasonal programming – The finding that nature connectedness fully mediates the relationship between experiences and friendliness suggests that parks should aim to build lasting emotional bonds, not just one-time satisfaction. Seasonal programming (spring planting, summer observation, autumn harvest, winter preparation) can encourage repeat visits and deepen children's sense of place and belonging. A loyalty program or "young farmer passport" that tracks participation across seasons could further enhance revisit intention and emotional attachment.

Fifth, integrate findings into park management and staff training – Park managers should be trained to understand the importance of nature connectedness and child-friendly design principles. Frontline staff should be equipped to facilitate immersive activities safely and engage children in cultural interpretation. Regular feedback collection from children and parents (e.g., simple smiley-face surveys) can help monitor progress and identify emerging issues.

5.3 COMPARISON WITH PREVIOUS STUDIES

The findings of this study align with and extend previous research in several ways.

Consistent with Mayer and McPherson (2021) and Cao et al. (2024), this study confirms that nature connectedness positively influences children's environmental perceptions and emotional well-being. However, this study extends their work by demonstrating that nature connectedness operates as a full mediator rather than a direct predictor, clarifying the mechanism through which spatial experiences translate into friendliness perceptions.

The results support Zhang and Li (2022)'s claim that agricultural landscape perception positively affects children's experience quality. However, this study adds nuance by showing that immersive participation ($\beta = 0.51$) is a stronger driver than landscape perception alone ($\beta = 0.42$), suggesting that activity-based engagement is more valuable than passive viewing.

Compared to Wang (2023), who focused on multi-sensory experiences in "five-sense farms," this study provides a more comprehensive model by including cultural significance perception and testing mediation through nature connectedness. The finding that cultural significance perception had the weakest effect ($\beta = 0.38$) suggests that simply displaying agricultural culture is insufficient; child-centered, interactive interpretation is needed.

The qualitative findings echo Lin (2020)'s observations about children's preference for explorable, participatory spaces over static, adult-oriented displays. This study provides empirical evidence from a Chinese rice field park context, supporting the cross-cultural validity of these behavioral tendencies.

5.4 LIMITATIONS OF THE STUDY

This study has several limitations that should be acknowledged.

First, regional limitation: The sample was drawn exclusively from Taiyuan Rice Field Park in Shanxi Province, China. While this park is representative of urban agricultural parks in northern China, the findings may not be fully generalizable to rice field parks in other climatic, cultural, or economic contexts. Future research should replicate the study across multiple parks in different regions.

Second, age-related measurement challenges: Children under 7 years old required parental assistance to complete the questionnaire. While this ensured data completeness, it may have introduced parental interpretation bias. Future studies could develop simplified visual scales (e.g., smiley-face Likert) for younger children or use observational methods as primary data sources for this age group.

Third, cross-sectional design: The study used a cross-sectional survey, which captures relationships at a single point in time but cannot establish long-term causal ordering. Longitudinal research tracking children's experiences over multiple visits would be valuable to examine how nature connectedness and perceived friendliness evolve with repeated exposure.

Fourth, seasonal variation: The study was conducted primarily during the summer and autumn seasons when the rice fields are lush and activities are abundant. Children's perceptions may differ during winter or early spring when the landscape is less vibrant. Future research should examine seasonal variations in experiential quality and friendliness perceptions.

Fifth, self-report bias: All measures were based on children's self-reports (with parental assistance). While this captures subjective experience, it does not include objective measures of spatial quality or behavioral observation. Future research could combine self-report data with GPS tracking, behavior mapping, or physiological measures (e.g., heart rate variability) to provide a more comprehensive assessment.

5.5 FUTURE RESEARCH DIRECTIONS

Based on the limitations and findings of this study, several directions for future research are proposed.

First, future research should expand the sample scope to include multiple rice field parks across different provinces and climatic zones in China, enabling comparative analysis of how regional agricultural practices, cultural contexts, and climate conditions moderate the relationships identified in this study.

Second, researchers should develop and validate age-appropriate measurement tools for children's environmental perception, including visual scales for preschoolers and digital or gamified survey formats for school-age children.

Third, longitudinal studies tracking the same children over multiple park visits (e.g., across seasons or years) would help determine whether the strong mediating effect of nature connectedness persists over time and whether cumulative experiences strengthen or weaken the relationship.

Fourth, experimental or quasi-experimental studies could test specific design interventions—such as adding interactive cultural displays, creating new immersive activity zones, or redesigning pathway layouts—to establish causal effects on nature connectedness and perceived friendliness.

Fifth, cross-cultural comparative research between China and other countries (e.g., Japan, Thailand, Vietnam, which also have rice field park traditions) would reveal whether the findings are culturally specific or universally applicable, contributing to global child-friendly city guidelines.

6. CONCLUSION

This study investigated the impact of agricultural experiential spaces on children's perceived friendliness, using Taiyuan Rice Field Park in Shanxi Province, China, as a case study. Drawing on child-friendly theory, environmental behaviorology, and nature connectedness theory, a mixed-method design was employed, combining a main survey of 350 children (aged 3–15) with semi-structured interviews with 15 participants.

The results yield several key conclusions. First, all three agricultural experiential dimensions—agricultural landscape perception, cultural significance perception, and immersive participation—significantly and positively affect nature connectedness, with immersive participation exerting the strongest effect ($\beta = 0.51$). Second, nature connectedness fully mediates the relationship between agricultural experiences and perceived friendliness ($\beta = 0.68$), confirming that emotional bonding with nature is the key psychological mechanism linking spatial experiences to children's friendliness evaluations. Third, children generally evaluated Taiyuan Rice Field Park positively across all dimensions, but the qualitative findings revealed specific areas for improvement: static cultural displays that fail to engage children, safety concerns during peak hours, and insufficient immersive activity options.

This study provides both theoretical and practical contributions. Theoretically, it expands child-friendly city theory into agricultural landscape contexts, clarifies the mediating role of nature connectedness, and offers a replicable evaluation framework for urban agricultural parks. Practically, it provides actionable strategies for park managers and designers: prioritizing immersive, hands-on participation; redesigning cultural interpretation from a child's perspective; enhancing safety and comfort for children of all ages; and strengthening long-term emotional connection through seasonal programming.

While the study has limitations, including regional specificity, cross-sectional design, and self-report bias, the findings offer robust empirical evidence for the importance of nature connectedness in shaping children's perceptions of agricultural experiential spaces. These insights can inform the ongoing development of child-friendly cities and the optimization of urban agricultural parks in China and beyond.

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