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Adorable interactions: investigating the influence of AI voice assistant cuteness on consumer usage intentions

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In an era where user experience reigns supreme, an unexpected element is subtly influencing our interactions with technology— "Cuteness." However, when discussing the design of digital products such as AIVAs, is cuteness merely a matter of appearance? This paper aims to unveil the complex psychological mechanisms and their impact on usage intention hidden behind the seemingly harmless allure of cuteness. Through an experimental study involving 284 participants and utilizing a moderated serial mediation model via PLS-SEM, this research reveals how aesthetic design differences influence usage intentions. The findings disclose three key insights: (1) A positive relationship between cuteness and usage intention is confirmed; (2) Social presence, performance expectancy and customer value act as serial mediations between cuteness and usage intention; (3) Perceived risk moderates the impact of cuteness on usage intentions by influencing social presence, performance expectancy, hedonic value and functional value. This contributes theoretical insights and practical guidance for the sustainable development and success of AIVAs.

KEYWORDS

cuteness, artificial intelligence, voice assistants, usage intention, customer value, social presence, performance expectancy

1 Introduction

With the advancement of technology and the diversification of consumer demands, understanding effective design for AI voice assistants (AIVAs) has become key to driving their intention to use these products. Effective design not only enhances users' usage intention but also elevates the product's allure and competitive position in the market. Particularly, the aesthetic attribute of "cuteness" in AIVAs presents a unique intersection of design and functionality (Caudwell and Lacey, 2020; Lv et al., 2021; Yu et al., 2022), which merits in-depth exploration. While existing literature provides insights into the impact of functional attributes on technology adoption (Kautish et al., 2023), the influence of non-functional attributes like cuteness remains underexplored.

Studies on non-functional attributes reveal that elements like voice and aesthetic appeal, including cuteness, significantly contribute to enhancing customer interaction (Caudwell and Lacey, 2020; Lv et al., 2021). Customers prefer to expect AI applications with a high cuteness for emotional tasks and a low cuteness for knowledge-based tasks (Lv et al., 2022). Some studies, in human-computer interaction, indicate a positive relationship between cuteness and consumer tolerance for service failures (Lv et al., 2021), and purchase intentions (Chen et al., 2022), others

present conflicting findings on cuteness's impact on usage intentions across different contexts (Zickfeld et al., 2018; Guha et al., 2022). Although these studies have explored the cuteness of AIVAs, the psychological basis of consumers' technology adoption is still insufficient. Based on this, this study focuses on the impact of cuteness on social presence, performance expectancy, and customer value to understand its potential to drive or block usage intention. Furthermore, perceived risk is emerging as a significant barrier to usage intention. Research indicates that perceived risk adversely affects consumers' purchase intentions, acting as a deterrent to the adoption of new technologies like AIVAs (Hansen et al., 2018; Hasan et al., 2021). This relationship between perceived risk and technology adoption underscores the need to examine how aesthetic attributes, such as cuteness, modulate these perceptions, potentially altering the adoption landscape for AIVAs.

Based on the above motives, this study is meticulously designed to unveil the relationship between the aesthetic design of AIVAs and consumer adoption behaviors. Specifically, our objectives are threefold: (1) We aim to rigorously assess the direct impact of cuteness on consumers' intentions to engage with AIVAs. This initial inquiry sets the stage for a deeper understanding of the aesthetic appeal's role in technology adoption. (2) On this basis, we further study how cute appearance stimulates users' performance expectancy and the impact of social presence on perceived value, thereby promoting the willingness to adopt technology. This exploration seeks to dissect the psychological underpinnings that translate aesthetic appreciation into usage intentions. (3) Lastly, we explore the moderating effect of perceived risk on these relationships, offering a nuanced view of how consumer apprehensions might amplify or mitigate the influence of cuteness on usage intentions. By delineating these pathways, our study not only contributes to the academic discourse on design aesthetics and technology acceptance but also provides actionable insights for practitioners aiming to refine AIVAs product designs to better meet consumer expectations and mitigate potential adoption barriers.

2 Related concepts and theoretical framework

2.1 Usage intention in AIVAs context

In the realm of AIVAs, comprehending user intentions to utilize technology is critical for both its development and broader adoption. In this research, usage intention is defined as the probability that users will adopt a technology based on their favorable evaluation of it. Studies in the field of AIVAs have demonstrated that aesthetic design profoundly impacts decision-making related to behavioral intentions. Notably, research indicates that AIVAs with a 'cute' appearance positively influence users' purchase intention (Yu et al., 2022). Moreover, an appealing design is crucial in enhancing user expectations and increasing tolerance toward service failures (Lv et al., 2021). Thus, a thorough investigation of aesthetic design plays a significant role in improving AIVAs' market penetration and achieving a distinctive advantage in product design.

2.2 Cuteness

Cuteness is generally defined as being appealing in an endearing or adorable manner (Hellén and Sääksjärvi, 2013). Based on previous

research, cuteness has been divided into two branches, one is Kindchenschema cuteness (e.g., baby schema), and another is whimsical cuteness. Kindchenschema cuteness is characterized by the design of cartoon-based, more or less human-like graphics, such as big heads, animal ears, and round eyes. Whimsical cuteness refers to an object that people feel is funny (Nenkov and Scott, 2014). Humor, one of the cuteness characteristics, can influence consumers' evaluations in human-robot interaction (Zhang et al., 2021). In the context of AI applications, the concept of cuteness is predominantly associated with graphical and phonetic features (Lv et al., 2022). Although these two dimensions of cuteness distinctly influence consumer behavior, this study narrows its focus to the design aspects of product appearance, specifically excluding whimsical cuteness. Consequently, our literature review concentrates on exploring the concept of Kindchenschema cuteness, underscoring its relevance and implications within the realm of product design.

2.3 Performance expectancy

Performance expectancy is one of the most important elements in the UTAUT model (Venkatesh et al., 2003). It plays a decisive role in whether users adopt the technology. In the context of AI, Performance expectancy refer to consumers' expectations of the degree to which reliable and consistent service will be provided (Gursoy et al., 2019). It represents a critical determinant in the adoption of AI devices, encapsulating the belief that these technologies can perform tasks as well as or better than humans. Users typically base their decision to invest time and resources in a technology on these expectations. In the scenario of human-computer interaction, users expect the voice assistant to accurately understand and respond to their voice commands, which includes precise recognition of natural language and timely feedback (Mohd Rahim et al., 2022). Additionally, the breadth and applicability of features are also focal points for users, who expect the AIVAs to go beyond performing basic tasks and excel in advanced functions like smart home management, schedule planning, and information retrieval (Lopatovska et al., 2019). As technology evolves, users' performance expectancy for AIVAs gradually increases. They are no longer satisfied with basic functionality but expect more intelligent and personalized services. These expectations drive continuous advancements in AIVA technology and provide direction for developers to optimize products and services. Therefore, deeply understanding and fulfilling users' performance expectancy is crucial to ensuring the success of AIVAs in stimulating usage intention.

2.4 Social presence theory

Short et al. (1976) conceptualized social presence as the perceptual phenomenon of feeling connected with others through communication media. Social presence refers to how salient the other person is in interaction as well as how salient interpersonal relationships are (Parker et al., 1978). Initially, this theory was used to evaluate the effects of social context on media consumption (Osei-Frimpong and McLean, 2018). In human-computer interaction scenarios, AIVAs could engender a sense of social presence, simulating the feeling of interacting with another human being. This simulation

is not merely about the functionality of these devices but also their ability to emit social cues that resonate with users on a personal level, thus fostering a deeper sense of connection and engagement (Kim et al., 2020). Users show a greater willingness to engage with AI technologies that manifest a strong social presence (Yu et al., 2022). This inclination is primarily attributable to the enhanced relational dynamics that a well-designed AIVA can facilitate. By incorporating elements of human-like interaction styles—such as conversational nuances, empathetic responses, and even elements of humor and personality—AIVAs are able to transcend their traditional roles as merely task-oriented assistants and evolve into social companions.

2.5 Customer value theory

Customer value is a pivotal determinant in consumer behavior, encapsulating consumers' perceptions, preferences, and evaluations of product attributes, performance, and outcomes (Kim et al., 2011). As defined by Woodruff (1997), customer value encompasses the assessment of product features and the consequential benefits or detriments that align with or impede the attainment of consumer objectives. This multifaceted construct includes dimensions such as social, functional, and emotional value (Lee et al., 2019; Su et al., 2019), in addition to monetary, symbolic, and normative value (Lee et al., 2019), along with expected, perceived, and received value (Ma et al., 2022). Moreover, hedonic and functional values (Boakye et al., 2018), alongside conditional and epistemic values (Hur et al., 2012), further delineate its breadth. Within the realm of human-computer interaction, emphasis has often been placed on hedonic and functional value due to their pronounced effects on consumer engagement and decision-making with AI technologies (Frank et al., 2021; Yin and Qiu, 2021; Yuan et al., 2022; Li et al., 2022b). In the context of human-computer interaction, hedonic value, defined as the emotional gratification consumers derive from engaging with AIVAs, propels interest and curiosity, leading to an enhanced intention to use (Lee et al., 2018; De Kervenoael et al., 2020). Functional value is conceptualized as the utility and effectiveness derived from the use of AIVAs, encompassing aspects such as task efficiency, information accuracy, and overall usefulness in facilitating daily activities (Hu, 2021).

3 Hypothesis developing

3.1 Direct effect

In the field of human-computer interaction, the influence of a product's aesthetic appeal, particularly cuteness, on user behavior is well-documented. Research has demonstrated that a cute appearance not only enhances tolerance for service failures (Lv et al., 2021) but also significantly encourages customer adoption of AI devices (Lv et al., 2022). Such aesthetic attributes have been shown to profoundly affect consumers' cognitive experiences (Huang et al., 2021) and increase engagement with AIVAs (Yu et al., 2022). The critical role of AIVAs' appearance in shaping customer behavior is underscored by findings that designers strategically employ cuteness to drive user adoption (Caudwell et al., 2019; Caudwell and Lacey, 2020). The prevailing consensus among researchers is that the cuteness of a

product can mitigate the perceived negatives associated with AI devices, leading to a more forgiving user attitude toward their limitations (Hui and Wenan, 2022). This phenomenon extends to chatbots, where increased cuteness has been linked to improved customer satisfaction, despite potential shortcomings (Zhu et al., 2023). The general positive consumer perception toward cute products (Lu et al., 2021), and the specific role cuteness plays in enhancing the marketability of virtual assistants (Caudwell and Lacey, 2020), further illustrate the potent influence of cuteness on consumer behavior. The ability of cute design elements, both visual and auditory, to stimulate purchase intentions (Shin and Mattila, 2021) reinforces the value of cuteness in product design and marketing strategies. Given this body of evidence indicating the broad and significant impact of cuteness on enhancing user interaction, adoption, and satisfaction with AI applications, we propose the following hypothesis:

> H1: Cuteness positively affects usage intention.

3.2 Mediation effect

Previous studies have elucidated the significant mediating roles of hedonic and functional values in shaping purchase intentions on online platforms, particularly under the influence of AI technology (Yin and Qiu, 2021). These values have been shown to directly impact consumers' intentions toward AI products (Frank et al., 2021), with the hedonic value of AI contactless services notably affecting perceived service quality (Li et al., 2022b). Despite this, the nuanced interplay between cuteness—aesthetic appeal—and usage intention, mediated by these values, remains underexplored. Thus, this study seeks to bridge this gap by examining how the aesthetic attribute of cuteness in AIVAs influences consumer behavior through the mediation of hedonic and functional values. Cuteness, characterized by features that evoke endearment and affection, holds the potential to alleviate consumers' negative emotions, thereby augmenting the hedonic value associated with products (Chou et al., 2022). This hedonic value, representing the emotional gratification consumers derive from engaging with AIVAs, propels interest and curiosity, leading to an enhanced intention to use (Lee et al., 2018; De Kervenoael et al., 2020). Notably, the presence of hedonic motivation has been found to influence intentions to use AI-enabled devices significantly (Lin et al., 2020), with prior experiences moderating the extent of this effect (Hu, 2021). In summary, we believe that hedonic value is the emotional and aesthetic satisfaction generated by contact with AIVAs, and is a key mediation in the relationship between cuteness and usage intentions. This mediation is based on the idea that cuteness enhances hedonic value, thereby positively influencing the intention to adopt AIVAs. Therefore, we hypothesize:

> H2a: Hedonic value mediates the relationship between cuteness and usage intention.

The proposition that cuteness can augment functional value stems from the premise that aesthetically pleasing designs can influence user perceptions of a product's utility. Specifically, cute products often evoke positive emotional responses, which in turn can lead to a more favorable assessment of the product's functional attributes. This phenomenon is supported by the Emotional Design Theory (Norman,

2005), which suggests that emotionally engaging designs can enhance user experience and perception of product utility. Furthermore, research by Chou et al. (2022) indicates that consumers purchasing cute products with functional value experience less guilt and more satisfaction, suggesting that cuteness enhances the consumption experience by satisfying both hedonic and functional needs. Moreover, empirical studies have demonstrated the importance of functional value in technology adoption and usage intention. For instance, de Kervenoael et al. (2020) highlighted that the perceived usefulness of technology significantly predicts consumers' intention to adopt it. Similarly, Hu (2021) found that consumers with extensive experience with service robots placed greater emphasis on functional value in their continued interaction and engagement decisions. These findings underscore the critical role of functional benefits in shaping consumer behavior toward technological products. Given the aforementioned arguments, it is posited that the cuteness of AIVAs can positively influence their perceived functional value, thereby impacting usage intention. This mediation effect is predicated on the notion that cuteness, by enhancing positive emotional engagement, can lead consumers to attribute higher utility to AIVAs, ultimately influencing their decision to use these technologies. Therefore, we refine our hypothesis as follows:

> H2b: Functional value mediates the relationship between cuteness and usage intention.

Research in human-computer interaction demonstrates the significant influence of social presence on user engagement and intention to use technology (McLean et al., 2021; Hu et al., 2023; Zhu et al., 2023). Specifically, the aesthetic design feature of cuteness in products can elicit social interactions, leading to stronger emotional connections with technology, as evidenced by consumers treating AI devices as companions (Caudwell and Lacey, 2020; Yu et al., 2022). Furthermore, a high level of social presence in robots has been shown to increase consumer acceptance, with cuteness enhancing this effect by triggering sympathy and caring emotions, thereby influencing adoption intention (Kim et al., 2022; Alsaad, 2023; Jin and Youn, 2023). Moreover, social presence is instrumental in elevating the perceived hedonic value of AIVAs, because consumers will perceive the product as a family member (Caudwell and Lacey, 2020), enhancing functional value (Choi et al., 2020; Lin et al., 2020; Moriuchi, 2021). This sequence suggests that cuteness enhances social presence, which in turn amplifies the hedonic value, ultimately fostering a stronger intention to use AIVAs. In the context of AIVAs, cuteness is hypothesized to sequentially enhance users' social presence and hedonic value perceptions, thereby positively influencing their intentions to use these devices. Specifically, cuteness, by invoking a stronger sense of social connectivity and emotional engagement, elevates the perceived hedonic value (emotional and aesthetic satisfaction) associated with the AIVAs. This enhanced hedonic value, in turn, fosters a greater inclination toward usage. This sequential mediation underscores the pivotal roles of social presence and hedonic value in translating the aesthetic appeal of cuteness into practical user usage. Thus, the following hypothesis is proposed:

> H3a: Social presence and hedonic value mediate the influence of cuteness on usage intention in a sequential manner.

This study proposes a nuanced understanding of performance expectancy in the context of AIVAs by examining the influence of cuteness on these expectations. Contrary to the traditional positive correlation between performance expectancy and technology adoption (Andrews et al., 2021; Chuah et al., 2021), this study explores the premise that high levels of cuteness might initially lower performance expectancy due to the Kindchenschema effect, where cuteness induces a more lenient or forgiving attitude toward the capabilities of the object (Lv et al., 2022). However, this initial reduction in performance expectancy does not completely preclude an increase in usage intentions. When users interact with AIVAs and begin to appreciate their capabilities, their performance expectancy may not be high if the AIVAs are perceived as cute. Studies have shown that consumers can tolerate mistakes if the AIVAs are cute (Lv et al., 2021, 2022). This initial perception of cuteness can lower performance expectations but does not necessarily discourage usage. As users continue to interact with their devices, the practical utility of AIVAs can modify these expectations, influencing their decision to adopt the technology. Because the functional value, or the actual utility generated by using AIVAs, acts as a bridge in this relationship, somewhat increasing consumers' usage intention (Matsuo et al., 2021). When performance expectations align with the actual functionality of AIVAs, the perceived functional value increases, positively impacting usage intent. From these observations, we can deduce the following hypothesis:

> H3b: Performance expectancy and functional value mediate the influence of cuteness on usage intention in a sequential manner.

3.3 Moderator effect

Perceived risk plays a pivotal role in shaping consumer behavior toward new technologies, including AIVAs. In the context of this study, perceived risk is defined as the consumer's assessment of the potential negative outcomes associated with using AIVAs, which may include concerns about privacy, security, or functionality failures (Yu et al., 2022). While the design feature of cuteness in AIVAs can enhance social presence and hedonic value, leading to increased usage intentions, this positive trajectory is contingent upon the level of perceived risk associated with the technology. Research indicates that cuteness, as a design attribute, can elicit positive emotional responses and foster a sense of social connection with technology (Lv et al., 2022; Yu et al., 2022). However, when perceived risk is high, concerns over potential negative outcomes may overshadow the positive perceptions elicited by cuteness, leading to a reduction in the perceived social presence of AIVAs. This diminished sense of social presence, coupled with decreased hedonic value due to escalated risk perceptions, adversely affects consumers' intentions to use AIVAs. Conversely, in scenarios where perceived risk is low, the endearing qualities of cuteness can fully manifest, enhancing both social presence and hedonic value, and thereby, strengthening usage intentions (Lu et al., 2019; Choi et al., 2020; Lin et al., 2020). Thus, following hypothesis is proposed:

> H4a: The effect of cuteness on social presence is moderated by perceived risk. When perceived risk is high, the effect of cuteness on social presence is weakened, and vice versa.

Furthermore, while cuteness can enhance the appeal of AIVAs, elevating both performance expectancy and functional value due to its positive emotional and aesthetic impact, the presence of perceived risk could alter this dynamic. In scenarios of elevated perceived risk, concerns about potential errors, privacy breaches, or the reliability of AIVAs may lead to heightened performance concerns. Such concerns can overshadow the positive perceptions associated with cuteness (Li et al., 2022a), thereby adversely affecting performance expectancy and the perceived functional value of AIVAs (Hussain et al., 2021). This attenuation of performance expectancy and functional value, in turn, dampens the propensity to use these devices. Conversely, when perceived risk is minimized, consumers may display a greater tolerance for potential service failures associated with AIVAs, allowing the positive attributes of cuteness to enhance social presence, performance expectancy, and functional value, ultimately encouraging usage intentions (Trivedi, 2019). Thus, following hypothesis is proposed:

> H4b: The effect of cuteness on performance expectancy is moderated by perceived risk. When perceived risk is high, the effect of cuteness on performance expectancy is weakened, and vice versa.

The research model is shown in Figure 1.

4 Methodology

4.1 Experimental design

First of all, experimental materials were designed. Participants were given experimental assessments of cuteness. In order to exclude participants' bias toward a particular brand preference and a particular product range, we set up 3 AIVA products without brand identity. The only difference between these three products is in terms of appearance design, and there is no difference in function. The first material (No.1) is a common speaker. The second one (No.2) is a speaker with a pair of eyes. The third (No.3) is a cat-like, which has a pair of cat ears and cute round eyes. We created movies of these three products, which will serve as experimental materials for future research, after determining, via repeated testing, that customers see three distinct products.

Then, the specific process of the experiment consists of three stages: In the first stage, participants will first answer a question about whether they have used an AIVA. If they answer "No," the system will automatically reject the sample. In the second phase, participants who answered "Yes" were randomly assigned a video about the AIVA. After watching the video, participants were asked to take a questionnaire. In the third stage, participants will answer all structured questions, including questions related to demographic variables, according to their feelings after watching the video. At this stage, the system will automatically extract samples with missing values, samples that fail to pass the screening questions, and samples that answered too fast.

4.2 Measurement

This study developed a high-quality measurement tool, namely the questionnaire. The 23 items in the questionnaire were drawn from prior research, such as Cuteness (C) (Lv et al., 2021), Social Presence (SP) (Mishra et al., 2021), Performance Expectancy (PE) (Gursoy et al., 2019), Hedonic Value (HV) (Ashfaq et al., 2021), Functional Value (FV) (McLean and Osei-Frimpong, 2019), Usage Intention (UI) (Hsiao and Chen, 2018), and Perceived Risk (PR) (Trivedi, 2019). In all questionnaires, a Likert scale of one to five was used [strongly
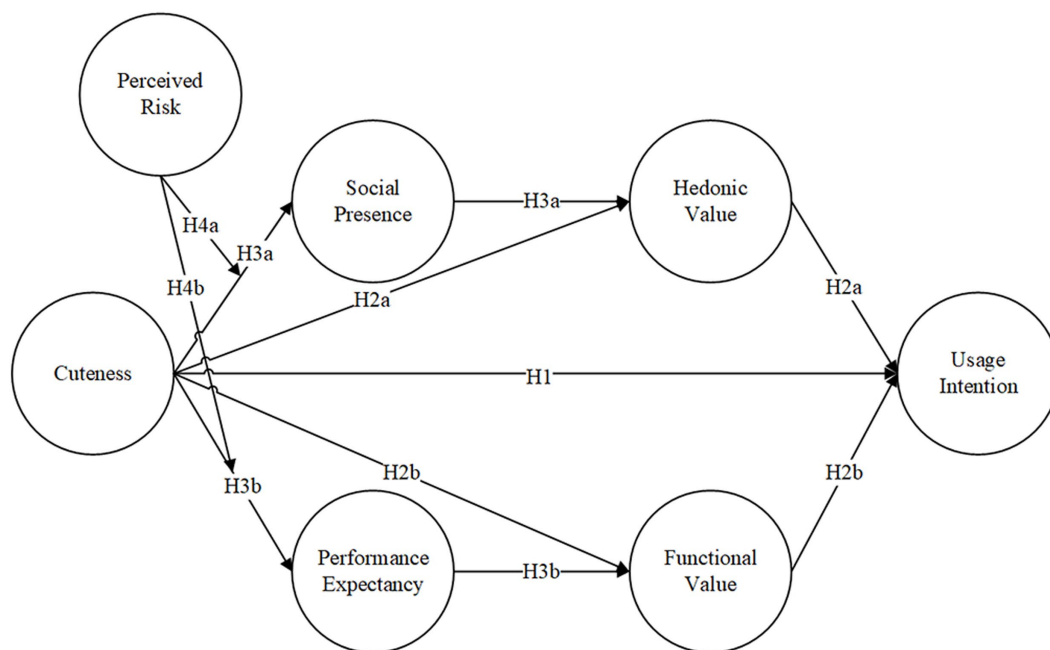

FIGURE 1
Research model.

TABLE 1 Demographic data.

Profile	Items	Frequency	Ratio (%)
Gender	Male	125	44.0
	Female	159	56.0
Age	20 and under	5	1.7
	21–30	178	62.8
	31–40	73	25.7
	41–50	18	6.3
	51 and over	10	3.5
Education	High school and under	34	12.1
	Undergraduate	200	70.2
	Master's	45	15.9
	Ph.D.	5	1.8
Disposable income/month (RMB)	1,000 and under	11	3.9
	1,001–2000	52	18.4
	2001–3,000	57	20.0
	3,001–5,000	75	26.4
	5,000 and over	89	31.3

disagree (1) to strongly agree (5)]. Considering the various uncertainties of the participants, which may affect the experimental results, we were assisted by the electronic questionnaire system (Credamo.com). The system can be configured to automatically reject invalid entries, recognize questions, handle missing values, and permit only one entry per ID.

To ensure the validity of the items' structure and content, multiple specialists were engaged. The initial translation into Chinese was conducted by the principal author, a proficient multilingual Chinese researcher, employing the translation/back-translation technique (Jones et al., 2001). Subsequently, various language research assistants undertook the task of retranslating the Chinese material to verify the translation's accuracy. Before formally starting the survey, this study referred to Lu et al. (2021)'s method to conduct a pre-test on the questionnaire. In the formal analysis, we utilized SmartPLS 4 to conduct PLS-SEM (Partial Least Squares Structural Equation Modeling) on the data. This method is especially well-suited for complex models and is robust against small sample sizes and non-normally distributed data.

4.3 Participants

Before the experiment commenced, we posted the details online and solicited volunteers familiar with AIVA products. Consequently, the sample group is confined to individuals who are interested in AIVA products, inclined to take risks, and receptive to change. Sample collection was conducted through random sampling to mitigate biases and ensure the representativeness of the samples. Concerning privacy and ethics, all participants' data was obtained with their explicit consent for research and analysis purposes only. Additionally, all authors are Chinese and possess sufficient expertise to assess the rationality of the results. We distributed the questionnaire through social media platforms such as WeChat, Weibo, Moments, and offered certain rewards for completing it. Eventually, 373 samples were procured through random sampling. Following data processing, 284 valid samples were retained. Data processing procedures involved removing null samples, discarding samples answered within an

unreasonable timeframe, eliminating samples that did not pass the screening questions, and excluding samples not considered within the sampling scope. Table 1 provides a summary of the sample data.

5 Result

5.1 ANOVA analysis

The data set was calculated by SPSS and Smart-PLS. Initially, we utilized SPSS 27 to conduct an ANOVA analysis to determine how participants perceived the cuteness of 3 types of AIVAs. As demonstrated in Table 2, the p value <0.05, suggested a statistically significant result, which means that participants can distinguish between the 3 types of AIVAs' cuteness. This is further underscored by the successful differentiation among the three experimental stimuli.

5.2 Assessment of the measurement model

Before analyzing the results, we evaluated the reliability and validity of the measurement tools to ensure that our experimental results could be reproduced. To evaluate whether the model is reliable, first of all, the Outer Loading (Outer Loading >0.7) is adopted to evaluate the reliability of each item. Then, we adopted AVE (AVE >0.5) to evaluate the reliability between items. Finally, Cronbach's α (Cronbach's $\alpha > 0.7$) and Composite Reliabilities (CR) were adopted to evaluate the overall reliability of each construct. As can be seen from Table 3, our model is reliable, which means that the model has repeatable applicability.

To evaluate whether the model effectively measured the structure, we first adopted the Fornell-Larcker criterion to evaluate the discriminant validity of each construct (Hair, 2017). The logic of the Fornell-Larcker approach is based on the idea that a construct has a greater variance with its associated indicators than with any other construct. As can be seen from Table 4, our model is valid, which means that the model has the applicability of accurate measurement.

TABLE 2 ANOVA results (Cuteness).

	Sum of squares	df	Mean square	F	Sig.
Between groups	6.76	2	3.38	6.05	0.00
Within groups	156.92	281	0.56		
Total	163.67	283			

5.3 Assessment of the structural model

Next, we evaluate the structural model. As shown in Figure 2, the R^2 value of all constructs is greater than 0.19 (Newsted et al., 1998), social presence (0.345), performance expectancy (0.209), hedonic value (0.419), functional value (0.522), usage intention (0.589), indicating a good fit of the overall model.

Stone-Geisser Q^2 (Stone-Geisser $Q^2 > 0$) was calculated using Blindfolding methods to assess the ability of the model to accurately predict the future (Hair et al., 2016). The results were social presence (0.299), performance expectancy (0.155), hedonic value (0.330), functional value (0.380), and usage intention (0.446).

To verify all the assumptions of the model, we resampled the data 3,000 times using bootstrapping. Finally, Table 5 shows the final analysis results. The path coefficient, standard deviation, and p-value of the model were obtained. From the results of the total effect in Table 5, Cuteness - > Usage intention = 0.634 (0.052) *** [0.424, 0.725]. Thus, H1 was supported.

5.4 Assessment of the serial mediation hypotheses

Having measured the total effect, we next measured the 2 serial-mediation effects. Table 5 shows that there are 6 significant mediation paths: Cuteness - > Hedonic value - > Usage intention 0.099 (0.028) *** [0.050, 0.158]; Cuteness - > Functional value - > Usage intention 0.036 (0.015) ** [0.011, 0.070]. Thus, H2a and H2b were supported. Cuteness - > Social presence- > Hedonic value - > Usage intention 0.030 (0.014) ** [0.008, 0.061]; Cuteness - > Performance expectancy - > Functional value - > Usage intention 0.033 (0.012) ** [0.012, 0.059]. Thus, H3a and H3b were supported. For the specific data see Table 5.

5.5 Assessment of the moderator hypotheses

Finally, we evaluated the moderating effect. The results show that Perceived risk adjustment on the serial-mediation model has significant statistical significance. Perceived risk significantly moderated the effect of cuteness on social presence [0.169 (0.063) ***]; Perceived risk significantly moderated the effect of cuteness on performance expectancy [0.170 (0.066) ***], which were shown in Table 5. The negative moderating effect (perceived risk) on the serial mediation model is statistically significant. Thus, H4a and H4b were supported. As shown in Figures 3, 4.

As delineated in Figure 3, under conditions of elevated perceived risk, the favorable influence of cuteness on usage intention is considerably diminished via the sequential mediation of social presence and hedonic value. Conversely, when perceived risk is diminished, the positive effect of cuteness on usage intention is markedly amplified through the same sequence of mediators—social presence and hedonic value.

As delineated in Figure 4, under conditions of elevated perceived risk, the favorable influence of cuteness on usage intention is considerably diminished via the sequential mediation of performance expectancy and functional value. Conversely, when perceived risk is diminished, the positive effect of cuteness on usage intention is markedly amplified through the same sequence of mediators— performance expectancy and functional value.

6 Discussion

Firstly, we speculate on the possible reasons for the positive influence of cuteness on usage intention. Cute features can quickly attract attention from consumers (Yu et al., 2022), such as big heads, animal ears, and round eyes. This phenomenon may stem from humans' innate attraction to juvenile traits, known as the "Kindchenschema cuteness." Cuteness is a determinant for AIVAs in terms of usage intention (Lu et al., 2021). As a result, consumers actively adopt AIVAs with cute appearance.

Secondly, we propose that the connection between cuteness and usage intention is successively mediated by social presence and hedonic value. The cute appearance of products can elicit users' perception of social presence in AIVAs (Yu et al., 2022). This emotional response to cuteness makes consumers more inclined to accept robots with heightened social presence (Kim et al., 2022), which in turn impacts their usage intention (Alsaad, 2023). Moreover, the perception of social presence allows consumers to perceive hedonic value (Moriuchi, 2021). When interacting with AIVAs, this perception transcends functional communication, endowing AIVAs with hedonic value and fostering a genuine sense of connection. Consumers are naturally drawn to experiences that evoke pleasurable emotions, which contributes to a positive emotional state and makes AIVAs with hedonic value more readily adopted. Thus, a cute appearance combined with perceived social presence effectively captures users' interest and emotional engagement, promoting happiness and satisfaction, thereby enhancing their desire to interact with these AI companions. It becomes apparent that social presence and hedonic value serve as a serial mediation between cuteness and usage intention.

Thirdly, we propose that the relationship between cuteness and usage intention is successively mediated by performance expectancy and functional value. In the context of AI-related devices, performance expectancy plays a crucial role in their adoption (Chuah et al., 2021). Smooth task execution, accurate information provision, and effective problem-solving build trust and satisfaction, enhancing consumers' willingness to use the device. Conversely, poor performance erodes confidence and may lead to abandonment. Previous research has

TABLE 3 Results of the measurement model.

Construct	Items	Outer loadings	Cronbach's α	C.R.	AVE.
Cuteness (Lv et al., 2021)	1.Overall, I think the AIVA is cute.	0.937	0.929	0.955	0.876
	2.Overall, I think the AIVA is pretty cute.	0.942			
	3.Overall, I think the AIVA is very likable.	0.928			
Social presence (Mishra et al., 2021)	1.Interacting with the AIVA makes me feel as comfortable as getting along with friends.	0.936	0.932	0.956	0.880
	2.When I interact with the AIVA, there is a feeling of interacting with people.	0.951			
	3.Interacting with the AIVA gives me some sense of a social life.	0.927			
Performance expectancy (Gursoy et al., 2019)	1.Compared to humans, the AIVA can provide more accurate service than humans.	0.825	0.895	0.927	0.718
	2.Compared to humans, the AIVA provides more accurate services with less error.	0.910			
	3.Compared to humans, the service provided by the AIVA is more stable.	0.892			
	4.Compared to humans, the AIVA provides more consistent information.	0.860			
Hedonic value (Ashfaq et al., 2021)	1.I think using the AIVA is a fun thing to do.	0.888	0.878	0.925	0.804
	2.I think using the AIVA is a pleasant thing to do.	0.900			
	3.I think using the AIVA is an entertaining thing to do.	0.902			
Functional value (McLean and Osei-Frimpong, 2019)	1.I think the AIVA will help me in my life.	0.853	0.883	0.919	0.741
	2.I feel that the AIVA has provided me with useful services and information.	0.866			
	3.I think the AIVA can effectively improve my life efficiency.	0.882			
	4.I think the AIVA can effectively improve my quality of life.	0.842			
Usage intention (Hsiao and Chen, 2018)	1.I may use the AIVA in the future	0.895	0.864	0.917	0.786
	2.I would like to recommend the AIVA to others	0.879			
	3.I am inclined to use the AIVA in the future	0.886			
Perceived risk (Trivedi, 2019)	1.I perceived the AIVA service was risky.	0.773	0.812	0.884	0.718
	2.I perceived that while using the AIVA, there was a chance that something could go wrong in the outcome.	0.880			
	3.I perceived that the AIVA service outcome and effect were difficult to predict.	0.884			

TABLE 4 Discriminant validity (the Fornell-Larcker criterion).

	Mean	S.D.	C	SP	PE	HV	FV	UI	PR
C	3.92	0.81	0.936						
SP	3.44	0.98	0.574	0.941					
PE	3.62	0.92	0.422	0.611	0.873				
HV	3.86	0.81	0.662	0.622	0.558	0.902			
FV	3.95	0.76	0.516	0.646	0.647	0.704	0.861		
UI	3.87	0.83	0.634	0.771	0.632	0.738	0.730	0.905	
PR	3.43	0.89	−0.132	−0.207	−0.127	−0.005	−0.098	−0.088	0.848

FIGURE 2
Path coefficient.
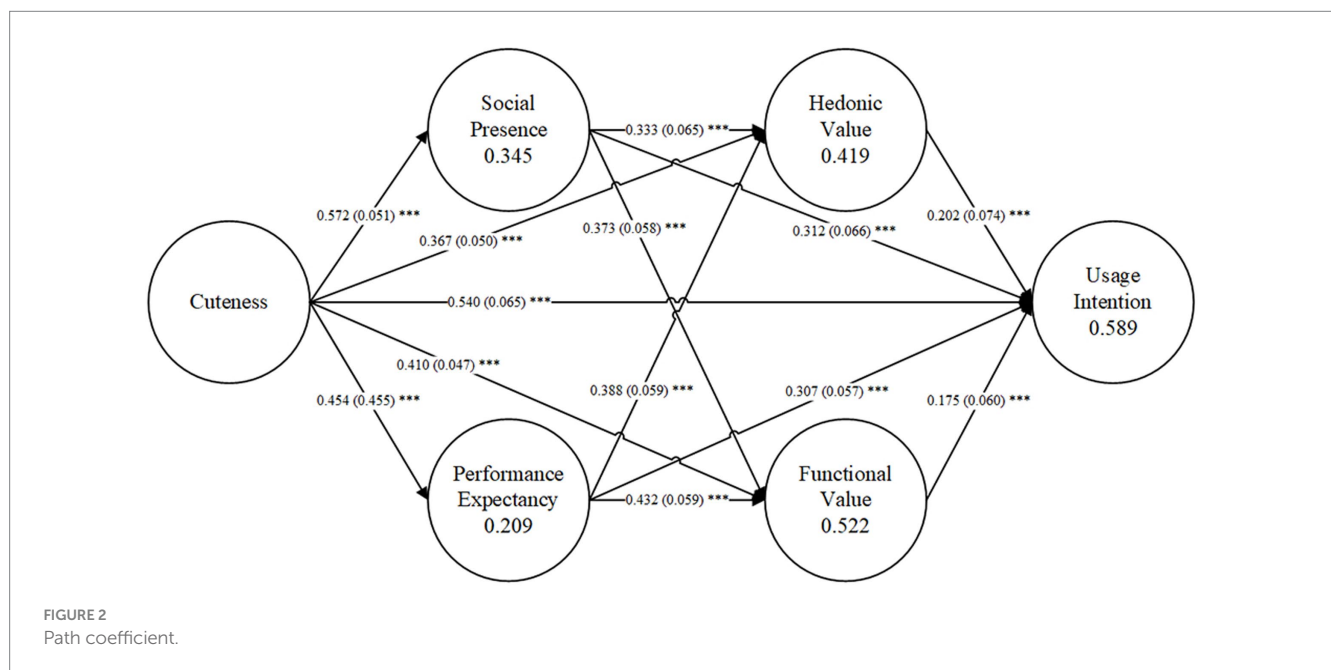
shown a negative correlation between cuteness and performance expectancy of AIVAs (Lv et al., 2021, 2022). However, our study provides a contrary result. Due to the unique nature of our study materials, we used long video stimuli instead of images, providing participants with a more immersive experience. This prolonged interaction fosters significant psychological and emotional investment, leading to higher performance expectancy. It is similar to caring for a cute puppy; despite its cuteness, the long-term care leads to performance expectations. Therefore, the mediating effect of performance expectancy and functional value manifests differently in longer-term interactions.

Lastly, this study found the moderating effect of perceived risk on the double serial-moderator models. (1) The results supported that perceived risk moderates the relationship between cuteness and social presence. The results show that the impact of cuteness on social presence is weakened by higher perceived risks. According to social presence theory (Short et al., 1976), if the perceived risk is too high, consumers will not perceive the cute product as a family member (Caudwell and Lacey, 2020), but as a silly product, and vice versa. (2) The results supported that perceived risk moderates the relationship between cuteness and performance expectancy. The results show that the impact of cuteness on performance expectancy is weakened by higher perceived risks, because the main factor affecting consumers' use

of AIVAs is the functional benefit (McLean and Osei-Frimpong, 2019). Therefore, when the perceived risk is high, the cuteness of AIVAs may make consumers feel that AIVAs are less capable and more likely to fail in service. The cuter product is not the better, the other side of cuteness is lack of ability (Li et al., 2022a). This, coupled with the fact that the average person may not fully understand the mechanics behind AI technology, will slow down the propensity to use it (Hussain et al., 2021).

6.1 Theoretical implications

Firstly, in the fields related to human-robot interaction and AI devices, the research related to product appearance mostly focuses on anthropomorphism, while further research on the perception of cuteness is needed. Therefore, this research made up for the deficiency. This study contributes to the literature regarding cuteness and usage intention in VA industry by revealing the impact of cuteness on usage intention.

Secondly, this study contributes to the literature regarding customer value by examining the mediating effect of hedonic value and functional value. Customer value is an inevitable argument in the research of consumer decision-making, and its mediating role has been discussed in the context of AI voice assistant research. However, the mediating role of customer value

TABLE 5 Summary results for the moderated mediation model.

Variable	SP	PE	HV	FV	UI
C	0.572 (0.051) ***	0.454 (0.455) ***	0.367 (0.050) ***	0.410 (0.047) ***	0.540 (0.065) ***
SP			0.333 (0.065) ***	0.373 (0.058) ***	0.312 (0.066) ***
PE			0.388 (0.059) ***	0.432 (0.059) ***	0.307 (0.057) ***
HV					0.202 (0.074) ***
FV					0.175 (0.060) ***
PR	−0.102 (0.059) 0.081	−0.018 (0.075) 0.808			
C*PR	−0.169 (0.063) ***	−0.170 (0.066) ***			
R^2	0.345	0.209	0.419	0.522	0.589
Stone-Geisser Q^2	0.299	0.155	0.330	0.380	0.446
Indirect effect 1	Cuteness - > Hedonic value - > Usage intention 0.099 (0.028) *** [0.050, 0.158]				
Indirect effect 2	Cuteness - > Functional value - > Usage intention 0.036 (0.015) ** [0.011, 0.070]				
Indirect effect 3	Cuteness - > Social presence- > Hedonic value - > Usage intention 0.030 (0.014) ** [0.008, 0.061]				
Indirect effect 4	Cuteness - > Performance expectancy - > Functional value - > Usage intention 0.033 (0.012) ** [0.012,0.059]				
Total effect	Cuteness - > Usage intention = 0.634 (0.052) *** [0.424, 0.725]				

P-value: *** < 0.001; ** < 0.01.

FIGURE 3
Moderating effect (Cuteness and social presence).
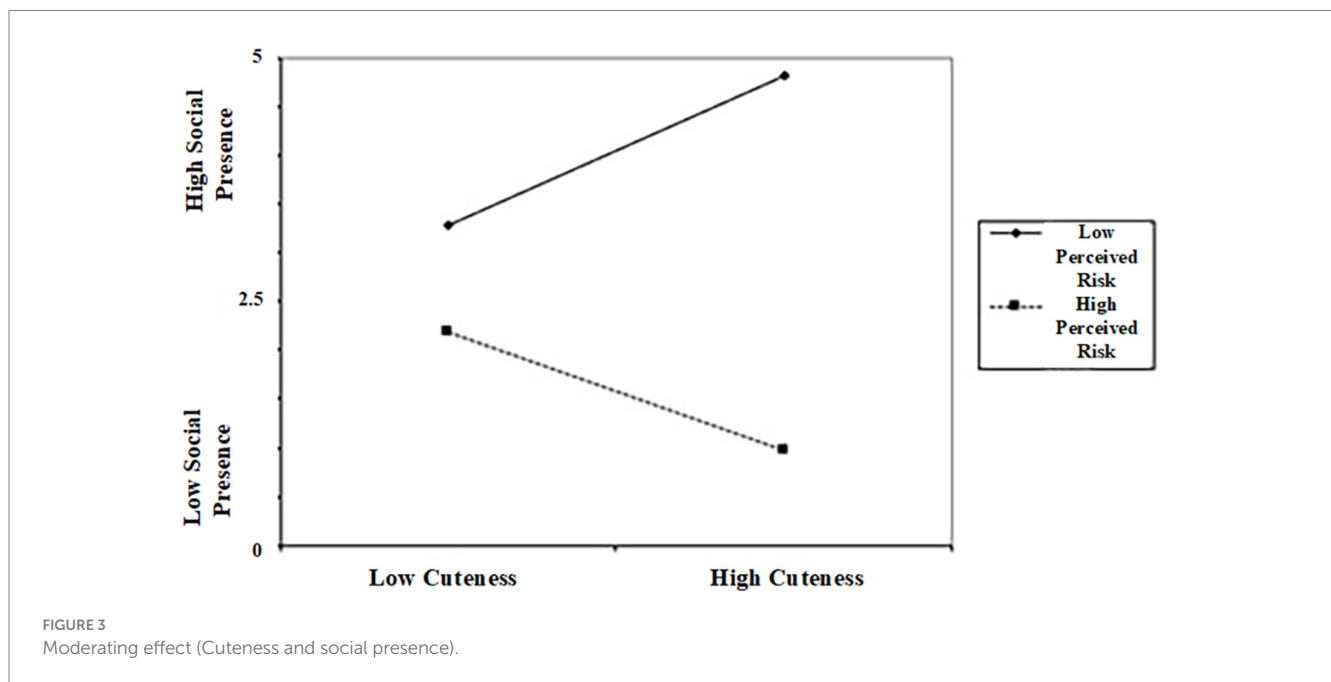
in the relationship between cuteness and usage intention is rarely discussed. Therefore, this study filled this research gap. In addition, social presence and performance expectancy are important factors affecting usage intention. However, it is not clear that these two factors are affected by cuteness and their impact on perceived customer value. Therefore, we discussed a serial-mediation model. Furthermore, we used samples from the Asian circle to get the opposite result from previous studies on cuteness and performance expectancy.

Thirdly, this study contributes to the literature of perceived risk by revealing the moderating effect of perceived risk. Consumers tend to be wary of objects that are too cute when the perceived risk is high. If a customer perceives a product to be high risk, especially if it appears suspiciously cute, he or she will be less likely to trust it. Customers will pay more attention to the high risk, so they will not devote as much time to evaluation of the product's appearance, which means that they will not be able to derive the perception of social presence and performance expectancy from the product. Besides, consumers' perceived risk of service failure is also an important factor affecting the relationship between cuteness and usage intention, which has been rarely discussed in the past in the context of the use of AIVAs. This study showed that perceived risk plays a moderating role in this scenario.

FIGURE 4
Moderating effect (Cuteness and performance expectancy).
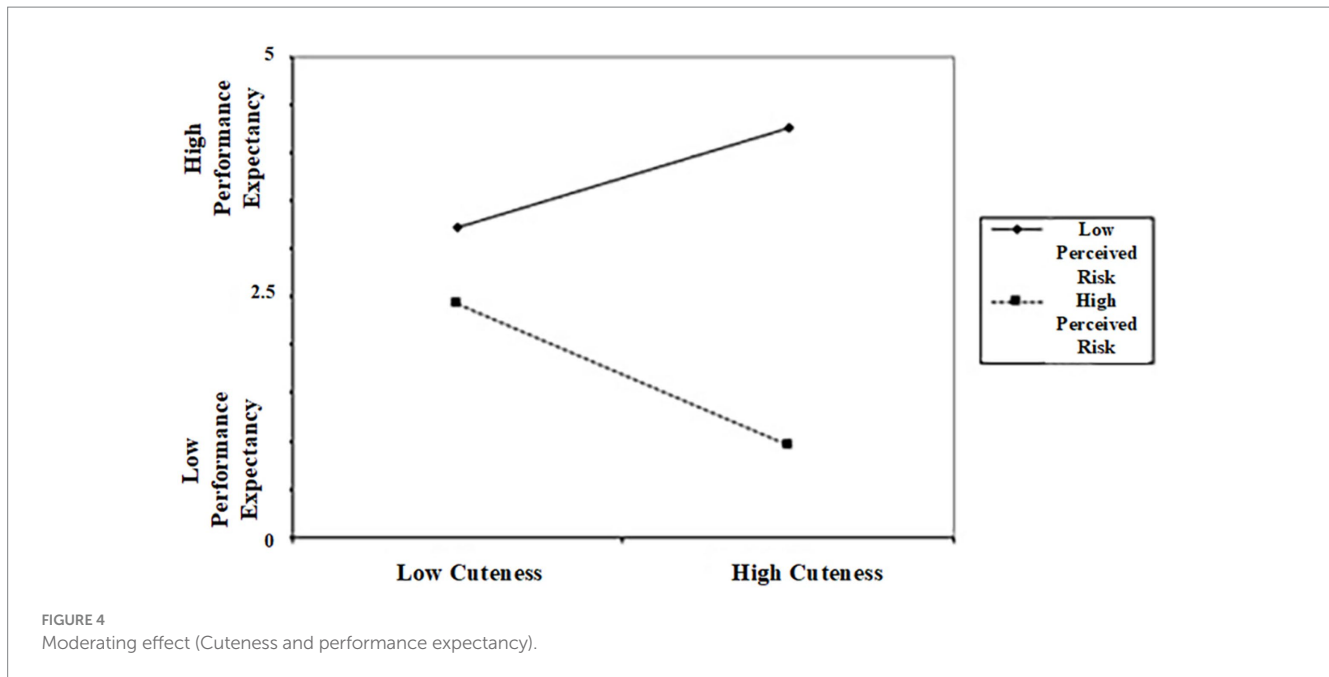
6.2 Practical contribution

Firstly, the findings of this study offer vital insights and recommendations for AIVAs' developers and designers. By uncovering consumers' preference for cute aesthetics, the research lays a theoretical groundwork for optimizing the appearance design of AIVAs. For instance, it suggests that AI featuring endearing elements like cat ears tends to garner more favor from consumers, thus guiding developers in tailoring products to align with consumer tastes.

Secondly, practitioners should heed the significant role of perceived risk in product perception. In product design, companies must not only prioritize aesthetics but also consider consumers' perceptions of service quality and functionality. Consequently, striking a delicate balance between cuteness and service quality becomes imperative. Moreover, emphasizing product quality, functionality, technological advancements, and innovation in marketing and advertising endeavors can bolster consumer trust and satisfaction.

7 Conclusion

This study revealed following results: (1) Cuteness will affect usage intention. In the case of an AI voice assistant, a cute product appearance can also inspire usage intention. (2) Social presence, performance expectancy and customer value act as serial mediations between cuteness and usage intention. (2a) Social presence and hedonic value will continuously mediate the relationship between cuteness and usage intention. The cuter the design of the product, the more consumers will see it as a friend, thus stimulating fun and increasing their intention to use it. (2b) Performance expectancy and functional value are a serial mediation between cuteness and usage intention. The cuter the design of the product, the more consumers will expect its performance, thus recognizing its functionality and promoting its usage intention. (3) Perceived risk serves a pivotal role

as a moderator. This investigation delves into the dual moderating influences exerted by perceived risk on the correlation between cuteness and usage intention. To elucidate, in scenarios with an elevated perceived risk, products exhibiting high cuteness might be seen as deficient in their ability or competence, thereby bearing implications for user enjoyment and usage intention. Second, when the perceived risk is high, consumers may not have a high expectancy for high-cuteness products, which will affect the experience and use intention of functional value. These findings remind companies that cuter is not always better.

8 Limitations and future research

Firstly, there is a shortcoming in the research method. Quantitative research can only obtain factual results, but not the specific reasons for consumers' behaviors. In the future, qualitative research based on this study will be continued to explore the specific reasons behind their behaviors.

Secondly, there are limitations regarding the data primarily focuses on young respondents, specifically those aged 21–30, and undergraduate students. This demographic concentration may limit the generalizability of the findings to a broader population. Future research should consider including a more diverse age range and educational backgrounds to enhance the applicability of the results.

Thirdly, these results are based on regression, and therefore potentially spurious correlations. Future research should use manipulation or longitudinal designs to provide causal evidence of mediation and moderation.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Author contributions

XY: Formal analysis, Project administration, Visualization, Writing – original draft, Writing – review & editing. XL: Conceptualization, Investigation, Software, Validation, Visualization, Writing – review & editing. XZ: Formal analysis, Software, Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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