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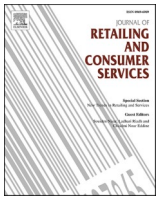

The influence of anthropomorphic appearance of artificial intelligence products on consumer behavior and brand evaluation under different product types

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ABSTRACT

While artificial intelligence products are widely used in the market, their anthropomorphic appearance design is becoming a frontier issue in product strategy and consumer behavior research. The aim of this study was to investigate the influence of anthropomorphic appearance on consumer behavior and brand evaluation under different AI product types. It was conducted in China, a new but rapidly-growing country in the field of Internet, AI technology and AI product consumption. This study conducted four situational experiments with a 2 (anthropomorphic design: anthropomorphic vs. non-anthropomorphic) × 2 (product type: hedonic vs. utilitarian) between subjects' experimental design. Data was collected from 1172 Chinese "Digital Natives" by using a structured questionnaire. The findings revealed that for hedonic AI products, anthropomorphic appearance improves consumers' purchase intention and brand evaluation through perceived entertainment, and intelligence level significantly moderates the mediating effect of perceived entertainment; while for practical AI products, anthropomorphic appearance improves consumers' purchase intention and brand evaluation through perceived usefulness, and intelligence level does not significantly moderate the mediating effect of perceived usefulness. There is no significant moderating effect of intelligence level on perceived usefulness. The study contributes to development and validation of a more comprehensive understanding and theoretical foundation of anthropomorphism, and furthermore explores the impact of anthropomorphic appearance on consumer behavior and brand evaluation under different AI product types. This study also provides insights for companies to apply anthropomorphic strategies.

1. Introduction

As the new driving force of the fourth industrial revolution, artificial intelligence technology is valued by many governments and enterprises, and the development of this technology field has been elevated to the level of national strategic development (Liu and Hu, 2017; Guo, 2019). In this context, well-known high-tech enterprises at, such as IBM, Microsoft, Google, Baidu, and KDDI, have taken AI technology as the core competitiveness of their future development and launched products loaded with AI technology one after another (Zhang et al., 2018). Under this trend, AI technology has started to be rapidly developed and applied in the design of products and services in different fields, and AI products and services in the market have become more diversified and common (Kietzamnn et al., 2018). For example, in the tourism industry, "unmanned hotels" and "tour guide robots" have been providing more convenient services to tourists in the corresponding scenarios; in the financial industry, digital assistants have become a common channel for corporate services and communication with customers; in addition, in the home service industry, intelligent sweeping robots, intelligent speakers, etc. have entered many households, providing consumers with cleaning and entertainment services in their daily lives; not only that, the 2022 Beijing Winter Olympics launched a smart restaurant to order, frying, food delivery, and other processes to robot intelligent processing. Products and services loaded with artificial intelligence technology have begun to emerge in many fields, and their application has become a new force in the consumer field.

In the field of academic research, there is a growing number of research on the influence of AI product on consumers' studies, but the research in this area is still in its infancy (Kumar, 2018)). Among them, the anthropomorphic appearance of AI products is an important factor in

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influencing consumers and therefore has received a lot of attention from scholars (Zhang et al., 2019). Some scholars believe that service robots with anthropomorphic features tend to enhance consumers' trust, thus promoting their purchase, use, and satisfaction (Mende et al., 2019). Some scholars also suggest that in the field of gaming products, the image of digital assistants with humanoid features can weaken consumers' perceived autonomy, which in turn reduces consumers' enjoyment and exploration of games (Kim et al., 2016); another part of the study points out that the humanoid appearance of robots increases consumers' heart warmth, but reduces consumers' attitude toward the robot's functional expertise (Kim et al., 2019). Thus, there is no unified view on the impact of anthropomorphic appearance on consumer behavior in the process of products in different fields, and the specific relationship of how it affects consumer behavior deserve further in-depth exploration and research (Chu et al., 2019).

Based on the above discussion, this study focuses on how the anthropomorphic appearance of AI products affects consumer behavior and brands in the context of different product types; discusses and analyzes the specific mechanism of the effect. This study explores the mechanisms of different product types on the anthropomorphizing of AI products, clarifies the conditions for companies to develop anthropomorphizing strategies, and further verifies the differences in consumer behavior and the underlying mechanisms of brand evaluation for different types of anthropomorphized AI products from the perspective of consumer sentiment. Through four experiments, this study found that for hedonic AI products, a high level of anthropomorphic appearance increases consumers' purchase intention and brand evaluation, and consumers' perceived entertainment plays a mediating role in this process; for practical AI products, a low level of anthropomorphic appearance increases consumers' purchase intention and brand evaluation, and consumers' perceived usefulness plays a mediating role in this process; and under different product types, a high level of anthropomorphic appearance increases consumers' purchase intention and brand evaluation, and consumers' perceived usefulness plays a mediating role in this process. For practical AI products, a low level of anthropomorphic appearance increases consumers' purchase intention and brand evaluation, and consumer perceived usefulness mediates this process. This study enriches the research field of the anthropomorphic appearance of AI products to a certain extent and further explores the role of different product types in this research field. This study aims to help companies understand the impact of different types of AI products' anthropomorphic appearance on consumer behavior and brand evaluation, and to provide an important theoretical basis for companies to effectively develop anthropomorphic appearance strategies.

2. Literature review

2.1. Anthropomorphic appearance

Anthropomorphism is the imaginary or real behavior of assigning certain human characteristics, motivations, emotions, etc. to non-human individuals (e.g., animals, and machines) (Murphy et al., 2019). In the field of consumer behavior, product anthropomorphism refers to the phenomenon of people perceiving inanimate products as having human physical and psychological characteristics (Landwehr et al., 2011). At present, the research field related to anthropomorphism focuses on three dimensions, namely, the appearance dimension, the internal dimension, and the social dimension. Among them, anthropomorphic appearance is the most intuitive form of expression for consumers' perception, and when a product resembles the overall human appearance or facial features or metaphorically represents human behavior, it is more likely to cause consumers to anthropomorphize the product (Blut et al., 2021).

Focusing on the field of marketing research, anthropomorphic marketing refers to stimulating and satisfying consumers' anthropomorphic tendencies to influence their attitudes, perception levels, and purchase behaviors. Existing researches point out that adding anthropomorphic elements to brand logos, mascots and promotional processes can increase consumers' affection and trust in the brand, thus increasing their emotions and purchase intention (Londoño and Ruiz de Maya, 2022; Chen et al., 2021). In addition, the impact of anthropomorphizing the appearance of AI products on consumers has been the focus of scholarly research. A large number of existing studies focus on the technological empowerment of AI products on consumers' purchase intention (Cui et al., 2022; Du and Xie, 2021; McLean et al., 2021), ignoring the direct impact of the appearance of AI products on consumers' consumer psychology and behavior. A few researches indicated that anthropomorphism can influence consumer attitudes and choices in a variety of ways. Some scholars have designed juicers with human feet on the bottom and irons and cell phones with human faces to investigate the different effects of anthropomorphic appearance on consumers (Puzakova et al., 2013). Some scholars have also designed table lamps with arms to measure the effect on consumer preference (Touré-Tillery and McGill, 2015). The results of the study show that anthropomorphic strategies can promote consumer affinity and preference for products, thus increasing the willingness to purchase such products (Blut et al., 2021).

2.2. Product type

In consumer behavior research, there are differences in the product information perceived by consumers for different types of products (Kumar et al., 2021). Therefore, consumers evaluate and make different purchase decisions based on the perceived product information during the consumption process. The types of products are classified according to different criteria (Li and Xie, 2020), for example, products can be classified into utilitarian and hedonic products based on their efficacy and purchase motives, whereas utilitarian products are often products or services that are mainly instrumental and functional (Bettiga et al., 2020) and are designed to help consumers solve specific problems or accomplish specific tasks. Examples include laptops, microwave ovens, shampoo, etc. While hedonic products usually refer to products that are mainly characterized by emotional and sensory experiences such as pleasure, fantasy, and fun during use (Shao and Li, 2021), and in this way satisfy consumers' emotional needs, such as game consoles, cosmetics, luxury goods, sports cars, etc. (Botti and McGill, 2011). Therefore, consumers make different purchase decisions based on their motivations and needs for purchasing the products. In the case of utilitarian products, consumers usually gather a lot of information about product knowledge and objective indicators and then analyze this information to make the most suitable and effective choice from a wide range of products (Li and Xie, 2020); while in the case of hedonic products, consumers pay more attention to the design and experience of using the product, and then perceive the positive emotions and entertainment brought by the product (Kivetz and Zheng, 2017). In addition, studies have shown that marketing strategies vary by product type and influence consumers' decision-making behavior (Park et al., 2016).

2.3. The influence of anthropomorphic appearance and product type on consumers' purchase intention and brand evaluation

The schema theory was first proposed by Kant, who believed that schema is a bridge between concept and object and that consumers' perception of consistency is generated by the degree of match between product features and schema features, which provides consumers with satisfaction that may affect consumers' evaluation of products (Luo et al., 2019), and some scholars have also verified that the perception of consistency affects consumers' brand evaluation (He et al., 2016). When the anthropomorphic features of a product's appearance match the human likeness to a greater extent, the stronger the perception of consistency generated by consumers, which in turn affects purchase intention and brand evaluation (Anshu et al., 2022). However, the higher the degree of anthropomorphic appearance of AI products, the better.

Companies need to properly and effectively combine the anthropomorphic appearance of intelligent products with the characteristics of the products themselves to achieve the desired marketing effect (Xu et al., 2017).

For hedonic products, consumers tend to focus on evaluating the overall process of purchase and consumption, paying more attention to the fun experience they get during use (Amatulli et al., 2020), and the pursuit of mental and multi-sensory pleasurable experiences that lead to emotional satisfaction (Alzayat et al., 2021). On this basis, scholars have found that highly anthropomorphic products are more pro-social, more emotionally connected to consumers, and further influence the choice and brand evaluation of anthropomorphic products (Sheehan et al., 2020). Scholars have noted that highly anthropomorphic products not only enhance the positive emotions associated with the hedonic attributes of the product but also additionally enhance the overall emotional experience of the product. Competing for the emotions of product hedonic attributes and highly anthropomorphic appearance attributes can lead to a leap in product emotional value (van Esch et al., 2019). In addition, consumers' brand attitudes have both cognitive and emotional elements, and the cognitive and positive emotional elements of high entertainment attributes lead to positive brand attitudes, which are consumers' overall evaluations of the brand (Fan et al., 2020), Therefore, the higher the degree of anthropomorphic appearance of a hedonic product, the stronger the positive emotions perceived by consumers, which in turn leads to higher purchase intentions and brand evaluations. On the contrary, a low level of anthropomorphic appearance does not effectively reflect the emotional attributes of the product, nor does it combine with the hedonic attributes of the product to better enhance consumers' purchase intention and brand evaluation.

2.4. Research gaps and contributions

Based on the literature review above, anthropomorphic design is widely used in corporate marketing campaigns as an effective marketing strategy. However, in the market, companies often make anthropomorphic associations with brand features, mascots and entire brands through designs that give relationships and human personalities to consumers, rarely anthropomorphic design of the product itself (Londoño and Ruiz de Maya, 2022; Chen et al., 2021). For example, KFC, Starbucks, NBA, etc. In addition, the market size of artificial intelligence products is huge, and most of the research on artificial intelligence products focuses on the effect of artificial intelligence technology on the product, especially the human-computer interaction ability, ignoring the fact that the product appearance design is the first impression on consumers and is the most intuitive impact on consumers purchase intention and brand evaluation (Cui et al., 2022; Du and Xie, 2021; McLean et al., 2021). In practice, companies also overemphasize technology and intelligence when declaring their products. Finally, although there has been a certain amount of research on the field of anthropomorphic artificial intelligence products, few studies have included product types into the overall research system to explore how different product types interact with anthropomorphic intelligent products, thus affecting consumers and brands.

Therefore, this study tries to design anthropomorphic appearance of AI products and combine it with product types to explore the impact of experimental products on consumer behavior. First, unlike previous studies, this paper investigates the impact of the appearance level of smart products on consumer behavior, rather than the technological level of smartness. Second, this paper focuses on the effect of anthropomorphic appearance in combination with different product types. It explores whether the effect of anthropomorphic appearance is the same for hedonic products and practical products. Third, it provides new ideas for companies to design and market smart products, and provides references for implementing anthropomorphic strategies for different types of smart products.

3. Research hypothesis and theoretical model

3.1. Anthropomorphism, product type, and consumer behavior

In marketing, the concept of compensatory inference refers to a specific reasoning mechanism for consumer intuition about market efficiency, market efficiency means that firms are rational and will produce products of equal value, which makes it possible that for two equally priced substitutes, consumers may presume that one attribute prevails and the other is inferior to that alternative (Gregory et al., 2019). As more and more companies add anthropomorphic elements to their brands or products, scholars started to pay attention to the unique advantages of anthropomorphism. According to Blut et al. (2021), anthropomorphism can fundamentally resonate with consumers and ultimately lead to improved consumer attitudes. For anthropomorphic real products, consumers tend to place more importance on objective indicators such as utilitarian functions, durability, and performance parameters and are not concerned with whether the product is anthropomorphic in appearance. On the contrary, some consumers believe that the higher anthropomorphic appearance will weaken the professionalism and functionality of the product. This is because when consumers buy products with anthropomorphic appearance, they think that the emotional value generated by high anthropomorphic appearance is contrary to the utilitarian value of the product itself based on the idea of compensation inference, i.e., they think that products with high emotional value have low practical value, which leads to a negative effect on the product. For products with low anthropomorphic appearance, the low emotional value does not affect consumers' evaluation of their practical value, nor does it affect consumers' purchase intention and brand evaluation. Based on the literature and discussion above, the following hypotheses are proposed.

H1a. For utilitarian AI products, a low anthropomorphic appearance is better than a high anthropomorphic appearance in increasing consumers' purchase intention and brand evaluation.

H1b. For hedonic AI products, a high anthropomorphic appearance is more likely to increase consumers' purchase intention and brand evaluation than a low anthropomorphic appearance.

3.2. The mediating role of consumer perception

(1) The mediating role of consumer-perceived usefulness

The Technology Acceptance Model (TAM) states that consumers' attitudes toward accepting and using new technologies are determined by a combination of consumers' perceived usefulness and perceived ease of use (Sagnier et al., 2020). Perceived usefulness is defined as consumers' subjective perception that the effects of using a new technology are more prominent and obvious than those of the previous technology when using the new technology. In recent years, some related studies have used technology acceptance models to explain the impact of AI on consumer acceptance (Mariani et al., 2022). Some studies have shown that perceived usefulness and perceived ease of use affect consumer acceptance of smart products (Huang and Lv, 2022) and purchase intentions (Chuah and Yu, 2021). Objectively, objective indicators such as the functionality and utility of utilitarian AI products can better help consumers achieve their needs; subjectively, the design of smart products affects consumers' attitudes and usage behavior through perceived usefulness (Perry, 2016).

According to the literature related to the mediating role of consumer-perceived usefulness, both utility and design affect consumers' perceived usefulness of a product, which in turn affects consumers' purchase intention and their evaluation of the brand (Liu et al., 2022). Therefore, in the experimental context of utilitarian AI products in this paper, consumers' perceptions of product quality and influenced by anthropomorphic design will affect consumers' purchase intentions and

brand evaluations through consumers' perceived usefulness. Based on this, the following hypotheses are proposed in this paper.

H2. For utilitarian AI products, consumer-perceived usefulness mediates the effect of anthropomorphic appearance on consumer purchase intention and brand evaluation.

(2) The mediating role of consumer-perceived entertainment

Consumers' emotions such as pleasure, joy, disgust, hatred, etc. can have an impact on their behavior (Uzir et al., 2021). Perceptual entertainment refers to the degree of emotional pleasure consumers experience when using a product (Liu et al., 2016). It has been shown that a pleasurable experience produces positive utility, pleasure, and satisfaction for consumers and that consumer satisfaction comes not only from the external benefits of the product or service itself but also from the emotional benefits the product brings to consumers (Uzir et al., 2021). Perceived entertainment is an intrinsic motivator of consumer usage behavior, and perceived entertainment positively influences consumers' purchase intentions (Qing and Haiying, 2021). The features and attributes of enjoyable AI products generate pleasurable perceptions that better satisfy the emotional experience consumers seek and help them to gain multisensory mental enjoyment. In addition, the emotional value of AI products is an important factor influencing consumers' purchase behavior (Ling et al., 2021), scholars have verified that the positive feelings and emotional states generated by smart watches (Hsiao and Chen, 2018) and smart speakers (Ling et al., 2021) have a significant impact on purchase intentions, and the anthropomorphic image of products can significantly enhance consumers' good feelings (Liu et al., 2022).

The aim of hedonic consumption is to meet the needs of enjoyment, these consumption materials can provide consumers' comfort and happiness (Shao and Li, 2021). In the process of shopping for anthropomorphic intelligent products, for consumers, selecting and using human-like products with intelligence brings more emotional communication, so consumers can better enjoy shopping, and further increase the purchase intention (Liu et al., 2022). Based on this, this study indicated that both hedonic products and anthropomorphic appearance affect consumers' perceived entertainment, which in turn affects consumers' purchase intentions and evaluation of brands. Therefore, in this study, in the experimental context of hedonic AI products, consumers' emotional perception of the product and the influence of anthropomorphic appearance design will affect consumers' purchase intention and brand evaluation through consumers' perceived entertainment.

H3. For hedonic AI products, consumer-perceived entertainment plays a mediating role in the effect of anthropomorphic appearance on consumer purchase intention and brand evaluation.

3.3. Moderating role of intelligence level

The level of intelligence refers to the ability of AI products to solve various problems through technologies such as the Web, the Internet of Things, and big data analytics. Different levels of intelligence have different impacts on consumers in the use of different product types (Zhang et al., 2019). Related studies have shown that utility consumers are cognitively driven, assessing the extent to which the product fulfills its purpose in terms of practicality and instrumentation; hedonic consumers are emotionally driven, assessing the extent to which the product itself is rewarding in terms of pleasurable sensory and experiential aspects (Longoni and Cian, 2022). Therefore, this paper discussed that for consumers with practical needs, whether a product has a high level of intelligence or not does not have much impact on the feeling of using the product; while for consumers with hedonic needs, they often want a product to have a high level of intelligence when using the product to satisfy their positive sensory experience and pleasant emotional pursuit.

H4a. For utilitarian AI products, the level of intelligence does not moderate the effect of anthropomorphic appearance on perceived usefulness.

H4b. For hedonic AI products, the level of intelligence influences the perceived entertainment by regulating the anthropomorphic appearance, which in turn influences consumer purchase intention and brand evaluation.

3.4. Proposed research model

In summary, this study proposes a theoretical model of the mechanism of the influence of product type and appearance anthropomorphism on consumers' purchase intention and brand evaluation (Fig. 1).

4. Research methodology

In this study, product type and product appearance anthropomorphism were used as independent variables, and in the experimental process, information such as text and picture materials were manipulated into real goods and hedonic products with a high degree of appearance anthropomorphism and real goods and hedonic products with a low degree of appearance anthropomorphism, and mediating variables were measured by perceived usefulness and perceived entertainment scales, and moderating variables were measured by intelligence level. Experiment 1 examines the main effects of product type and product appearance anthropomorphism on consumers' purchase intention and brand evaluation, experiment 2 examines the mediating effects of perceived usefulness and perceived entertainment on the relationship between appearance anthropomorphism and purchase intention and brand evaluation, and experiment 3 examines the moderating effect of intelligence level on the main and mediating effects.

4.1. Measures scale development

The data of this study was obtained from Internet users in China. China is a new but rapidly-growing country in the field of Internet, AI technology and AI product consumption (Xing et al., 2021). There are over 1 billion mobile Internet users, about 24% of Internet users own AI devices (Ling et al., 2021). Online questionnaire was used to collect empirical data, the construct items were taken from established and validated scales, shown in Table 1. Each item was measured with 7-level Likert scale (1 = strongly disagree, 7 = strongly agree). However, a small number of items were adjusted according to research requirements.

4.2. Sample and survey information

Since the participants were from China, the scale was translated into Chinese by three *marketing* scholars who were proficient in English and Chinese, and then proofread by twelve graduate students to ensure the validity of the translation in order to ensure the comprehension of the text by the participants. Before distributing survey questionnaires, the validity and reliability were verified again through personal interviews conducted with three AI products users. Then the official questionnaires were collected through the Chinese survey website Questionnaire Star (www.wjx.cn), which provides a fast, easy and inexpensive way to collect data online. This study used the platform's paid promotion service, where valid responses earn points and can be redeemed for prizes. All data were collected between July and September 2022 and basic sociodemographic information was requested.

People born around and after 1980 were selected as the target respondents, who were called "Digital natives" (Murat et al., 2016; Fan, 2017). They grow up in the era of Internet and AI technologies. In addition, they are not only interested in AI products, but also the main target customers for AI products company (Vlačić et al., 2021; Wang et al., 2021; Hsin et al., 2019). Totally the responses of 1234 participants

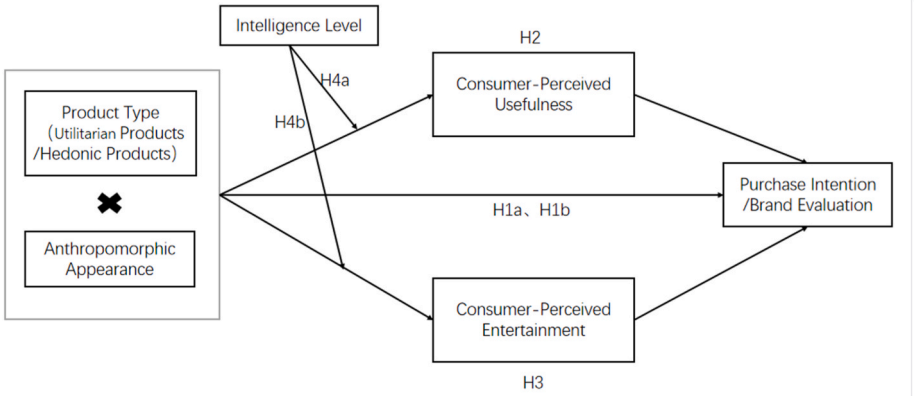

Fig. 1. Conceptual research framework.

were collected, of which 1172 were valid questionnaires. Furthermore, systematically eliminated responses that did not answer the trap question "This question is to determine whether the concentration option, please choose yes." correctly to ensure high quality data samples (Jacobson et al., 2020). In order to test whether the survey sample has response bias, the independent sample T test was conducted on the personal descriptive statistics of the sample, and the result showed that $t > 0.05$, indicating that there were no significant differences in covariables (sex, age, education), and further indicating that there was no response bias in the questionnaire sample. Detailed demographic information is shown in Table 2.

4.3. Pre-experiments

The purpose of the pre-experiments was to identify suitable experimental products and to test the effectiveness of the experimental products for anthropomorphic appearance and product type manipulation.

(1) Identify products suitable for this study

In this study, smart speakers are selected as hedonic products and floor mopping robot as utilitarian products. The reason of selection mainly based on the following considerations: First, smart speakers are in the growth period, the market size is growing rapidly, and floor mopping robots' sales are also rising year by year (Chen et al., 2022), huge sales volume and high penetration rate make the experimental results more representative. Second is the use of motivation, previous research pointed out that consumers use smart speakers for enjoyment and entertainment (Lee and Cho, 2020), while consumers buy floor mopping robots for the utilitarian functions such as saving time and relieving burden (Fu et al., 2020; Honig et al., 2022), both of which are exactly in line with the definition of hedonistic and utilitarian goods.

(2) Testing the effectiveness of experimental products for anthropomorphic appearance manipulation

In this study, an online scenario experiment was conducted and an online scenario questionnaire was distributed using online recruitment. Referring to the studies by Wang and Wang (2021) and Huang et al. (2021), the participants were shown product pictures and textual materials and were informed of the definitions of hedonic, utilitarian and anthropomorphic appearance. The target products selected for this study are shown in Fig. 2.

First, the experiment explains that the anthropomorphic appearance of a product is an intuitive representation. If a product has human appearance or facial features, or metaphorically human behavior, it will convince consumers that the product is "human". Participants were then randomly assigned to two groups for two products with different degrees of anthropomorphic appearance. The participants were asked to rate the degree of anthropomorphic appearance of the AI products through their visual perception of the product image, which was measured on a 7-point Likert scale based on Kim and McGill (2011), shown in Table 1. The results showed that the low anthropomorphic appearance group was the most popular, and the low anthropomorphic appearance group rated the anthropomorphic appearance significantly lower than the high anthropomorphic appearance group ($M_{low} = 2.03$, $SD = 1.10$; $M_{high} = 4.52$, $SD = 1.62$; $t(92) = -8.71$, $p < 0.001$). Pre-experimental results indicated that participants were able to identify AI products with different degrees of anthropomorphic appearance and that the anthropomorphic appearance manipulation was effective.

(3) Test the effectiveness of experimental products on product type manipulation

Studies have shown that product type is not determined only by the attributes of the product itself, but in most cases, it is subjectively determined by consumers according to their needs and financial means (Gong and Sheng, 2021). For example, a watch is a utilitarian product (informing time) for some consumers, while it is a hedonic product (decorative) for others. Therefore, to improve the validity of the experimental results, this study left the attribution of product type to the participants' judgment. First, the study explained to the participants that utilitarian product is goal and function-oriented product, this product is needed for life and satisfies basic needs. Consuming such products rarely creates feelings of guilt or pleasure. In contrast, hedonic products are generally not essential products but bring pleasure and experience to people. Individuals may feel guilty about consuming such products or experiencing such services, and this guilt can reduce the pleasure of consumption.

Participants were then randomly assigned to groups of two different types of AI products and the product types were manipulated by describing different features of the AI products (Davenport et al., 2020). Specifically, the chosen utilitarian product was described as "This is a very durable AI product. This product combines sweeping and mopping into one and is a great helper for sharing household chores." Hedonic product description: "This is a very stylish AI product. This product integrates interactive entertainment and is an additive to a humdrum life." After reading the corresponding materials, participants rated the product attributes of the AI products (1 = utilitarian product, 7 = hedonic product) about their identification of the product's use of features and motivation to purchase, with the measurement of product type drawing from Zhao et al. (2020). The results of the experiment showed that the utility group rated the product types significantly lower than the hedonic group ($M_{uti} = 4.10$, $SD = 2.18$; $M_{hed} = 5.42$, $SD = 1.34$; $t(118) = -3.99$, $p < 0.001$), indicating that participants were able to identify the different types of AI products, demonstrating the validity of the product

Table 1
Measurement scale and summary.

Construct	Item	Scale reference
Anthropomorphize	A1 The product looks like human. A2 The product seems to be conscious. A3 The product looks friendly.	Kim and McGill (2011)
Product type	Hedonic products: products that bring pleasure and experience to people. Individuals may feel guilty about consuming such products or experiencing such services, and this guilt can reduce the pleasure of consumption. Utilitarian product: Goal and function oriented product. This product is needed for life and satisfies basic needs. Consuming such products rarely creates feelings of guilt or pleasure. Scored at 1 = utilitarian and 7 = hedonic.	Zhao et al. (2020)
Perceived usefulness	PU1 Using this product makes me do the sweeping task faster sweeping tasks. PU2 Using this product will improve my sweeping results. PU3 Using this product will improve my sweeping efficiency. PU4 Using this product will make sweeping easier. PU5 I find this product useful for housework.	Ventre and Kolbe (2020)
Perceived entertainment	PE1 I feel novel using this product. PE2 I feel fun using this product. PE3 Using this product adds enjoyment to my life. PE4 Using this product makes me feel relax	Arruda Filho et al. (2020)
Intelligent level	IL1 The status of the product can be monitored. IL2 Push notifications when products and software need to be upgraded. IL3 Give a reminder when a special day or moment comes. IL4 The location of the product can be accurately located. IL5 The product can be operated or controlled remotely IL6 Some operations or controls can be performed by voice. IL7 Ability to operate the product through other devices. IL8 Automatically adjust the power mode when the power is low. IL9 At some point in time can assist the user to make decisions.	Li et al. (2017)
Purchase intention	PI1 I would like to buy this product in the picture. PI2 I would consider buying this product in the future. PI3 I would recommend this product to friends and family.	Vuong and Khanh Giao (2020)
Brand evaluation	BE1 I think the brand of the product in the picture is good. BE2 I think the brand of the product in the picture is worth having. BE3 I would support the brand of this product in the picture.	Kim and Chao (2019)

type manipulation. The results of the pre-experiment suggest that the experimental product manipulation of anthropomorphic appearance and product type was effective and will be used in subsequent formal experiments.

4.4. Experiment 1

The purpose of Experiment 1 was to test Hypothesis 1, i.e., the interaction between the anthropomorphic appearance of AI products and product type on consumer purchase intention and brand evaluation.

(1) Experimental design and participants

Experiment 1 used a 2 (degree of anthropomorphic appearance: low vs. high) × 2 (product type: utilitarian vs. hedonic) between-group factorial experimental design. Participants were randomly assigned to four different experimental groups, A, B, C, and D. Group A was for high anthropomorphic appearance/hedonic products, group B was for low anthropomorphic appearance/hedonic products, group C was for high anthropomorphic appearance/utilitarian products, and group D was for low anthropomorphic appearance/utilitarian products. First, participants rated the degree of anthropomorphism and product type of the AI product after reading the corresponding experimental materials and product images for each group. The scale for anthropomorphic appearance were adjusted and translated from Kim and McGill (2011) with a Cronbach's alpha of 0.890. The attributes were then scored based on the description of the product seen (1 = utilitarian goods, 7 = hedonistic goods), with the product type measure drawing from Zhang et al. (2021). Second, participants were asked to fill out a purchase intention scale (Table 1) without considering the price, drawing from Vuong and Khanh Giao (2020), Cronbach's $\alpha = 0.878$. Participants then read further from the brand description in the utilitarian goods group: "This brand is based on the idea of making robots 'serve everyone' mission, insists on consumer demand as the guide for R&D, and is committed to creating service robots for all scenes of life, bringing consumers a new experience of wisdom, convenience, and humanity". Brand description with the hedonic group: "The brand defines voice assistants as 'experiences that span between devices', aiming to allow consumers to communicate with each other through voice and devices, thus forming a cross-brand, cross-platform connection, and control of smart products and providing consumers with a new way of interaction. " The scale were based on Kim and Chao (2019) shown in Table 1, Cronbach's $\alpha = 0.873$. Finally, to further improve the validity of the experimental data, a mandatory response requirement was set in the questionnaire to avoid missing data (Shen et al., 2021), and participants were rewarded accordingly after completing the experiment independently.

(2) Experimental result

The results of the manipulation test for product anthropomorphic appearance showed that the low anthropomorphic appearance group rated the anthropomorphic appearance significantly lower than the high anthropomorphic appearance group ($M_{low} = 3.51$, $SD = 1.82$; $M_{high} = 5.20$, $SD = 1.32$; $t(318) = -9.51$, $p < 0.001$), indicating that the manipulation test for anthropomorphic appearance of the AI products in the experiment was valid. The results of the manipulation test for product type showed that the utility group rated the product type significantly lower than the hedonic group ($M_{uti} = 4.16$, $SD = 1.78$; $M_{hed} = 5.39$, $SD = 1.18$; $t(318) = -7.29$, $p < 0.001$), indicating that the manipulation test for product type of the AI product in the experiment was valid.

With purchase intention as the dependent variable, the interaction between anthropomorphic appearance and product type was significant $F(1, 319) = 41.59$, $p < 0.001$, based on the results of the two-factor ANOVA analysis, which verifies that anthropomorphic appearance and product type jointly influence consumers' purchase intention. According to the independent samples *t*-test, for practical products, low anthropomorphic appearance stimulates consumers' purchase intention more than high anthropomorphic appearance ($M_{low} = 5.57$, $SD = 0.99$; $M_{high} = 4.50$, $SD = 1.51$; $t(158) = 5.28$, $p < 0.001$); for hedonic products, high anthropomorphic appearance stimulates consumers' purchase intention more than low anthropomorphic appearance ($M = 4.50$, $SD = 1.51$; $t(158) = 5.28$, $p < 0.001$); for hedonic products, high anthropomorphic appearance stimulates consumers' purchase intention more than low

Table 2
Demographics of the respondents.

Frequency (Percentage)	Pre-experiments	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Gender					
male	76(35.5)	139(43.4)	111(40.5)	80(39.6)	83(51.2)
female	138(64.5)	181(56.6)	163(59.5)	122(60.4)	79(48.8)
Age(years)					
18–25	82(38.3)	105(32.8)	89(32.5)	83(41.1)	69(42.6)
26–35	95(44.4)	144(45.0)	162(59.1)	89(44.1)	78(48.1)
36–45	29(13.6)	60(18.8)	21(7.7)	30(14.9)	15(9.3)
46 and above	8(3.7)	11(3.4)	2(0.7)		
Education					
specialized schools	44(20.6)	63(19.7)	43(15.7)	30(14.9)	15(9.3)
college degree	144(67.3)	229(71.6)	205(74.8)	132(65.3)	126(77.8)
postgraduate studies	26(12.1)	28(8.8)	26(9.5)	40(19.8)	21(13.0)

Fig. 2. Target products.

anthropomorphic appearance ($M_{low} = 4.97$, $SD = 1.28$; $M_{high} = 5.61$, $SD = 0.84$; $t(158) = -3.75$, $p < 0.001$) (Fig. 3).

With brand evaluation as the dependent variable, the interaction between anthropomorphic appearance and product type was significant $F(1, 319) = 34.89$, $p < 0.001$, based on the results of the two-factor ANOVA analysis, which verified that anthropomorphic appearance and product type jointly influence consumer brand evaluation. Based on the results of the independent samples *t*-test, it is clear that for practical products, low anthropomorphic appearance improves consumer brand evaluation more than high anthropomorphic appearance ($M_{low} = 5.39$, $SD = 0.92$; $M_{high} = 4.65$, $SD = 1.40$; $t(158) = 3.94$, $p < 0.001$); for hedonic products, high anthropomorphic appearance improves consumer brand evaluation more than low anthropomorphic appearance brand evaluation ($M_{low} = 4.95$, $SD = 1.12$; $M_{high} = 5.65$, $SD = 0.74$; $t(158) = -4.51$, $p < 0.001$) (Fig. 4).

(3) Summary

The results of Experiment 1 show that for utilitarian smart products, low anthropomorphic appearance is better than high anthropomorphic appearance in increasing consumers' purchase intention and brand evaluation; for hedonic AI products, high anthropomorphic appearance is better than low anthropomorphic appearance in increasing consumers' purchase intention and brand evaluation. Therefore, hypothesis 1 was verified.

4.5. Experiment 2

The purpose of Experiment 2 was to test the effect of anthropomorphic appearance and product type of AI products on consumers' purchase intention and brand evaluation simultaneously and through the mediating effect of perceived usefulness and perceived entertainment on purchase intention and brand evaluation.

(1) Experimental design and participants

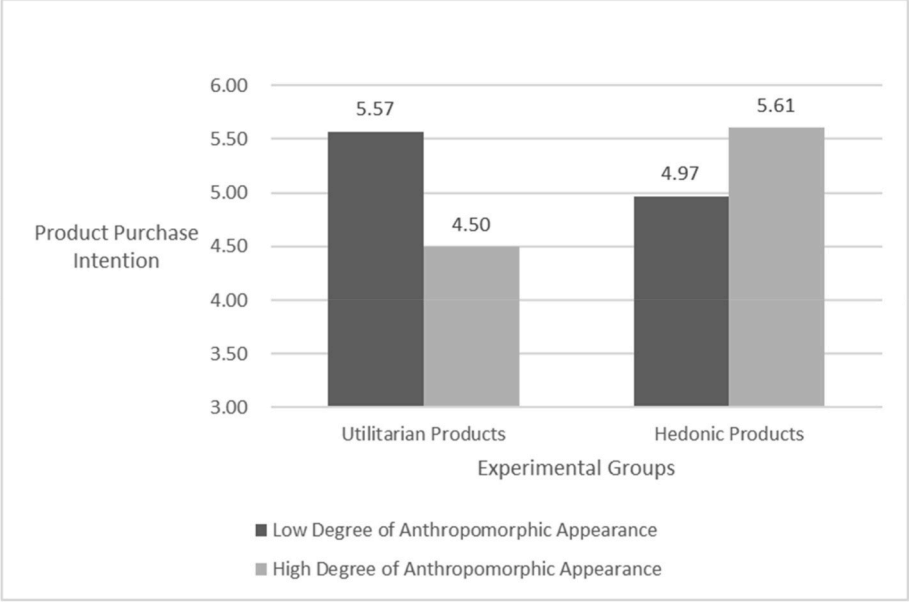

Fig. 3. The interaction between anthropomorphic appearance and product type on purchase intention.

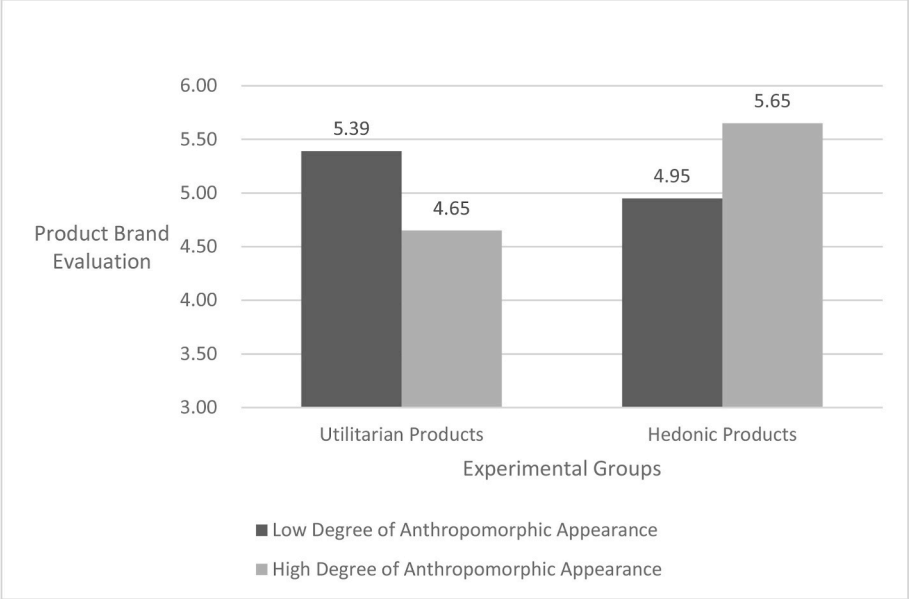

Fig. 4. The interaction between anthropomorphic appearance and product type on brand evaluation.

Experiment 2 used a 2 (degree of anthropomorphic appearance: low vs. high) × 2 (product type: practical vs. hedonic) between-group factorial experimental design. For participants in the utility group, after reading the corresponding experimental materials and product images, participants first rated the anthropomorphism of the group on the same scale as Experiment 1, Cronbach's α = 0.825. Second, participants filled out a perceived usefulness scale drawing from Ventre and Kolbe (2020) shown in Table 1, Cronbach's α = 0.924. Finally, participants filled out a purchase intention scale (same as Experiment 1, Cronbach's α = 0.903) and the brand evaluation scale (Cronbach's α = 0.899) and report demographic information.

For the participants in the hedonic group, after reading the corresponding experimental material and the product image, the participants first rated the degree of anthropomorphism of the group with Cronbach's α = 0.788. Second, the participants filled out a perceived hedonic scale adjusted from Arruda Filho et al. (2020) shown in Table 1, Cronbach's α = 0.782. Finally, participants completed the purchase intention scale (same as Experiment 1, Cronbach's α = 0.731) and the brand evaluation scale (Cronbach's α = 0.770), and reported demographic information.

(2) Experimental result

The results for the utility group showed that the low anthropomorphic appearance group rated anthropomorphic appearance significantly lower than the high anthropomorphic appearance group ($F(1,146) = 5.74, t(146) = -3.64, p < 0.001$), and participants in the low anthropomorphic appearance group had low perceptions of anthropomorphism ($M_{low} = 3.74$, $SD = 1.79$) and participants in the high anthropomorphic appearance group had high perceptions of anthropomorphism ($M_{high} = 4.72$, $SD = 1.48$), indicating the validity of the anthropomorphic appearance manipulation test for AI products in the

utility group.

The results for the hedonic group showed that the high anthropomorphic appearance group rated anthropomorphic appearance significantly lower than the low anthropomorphic appearance group ($F(1,124) = 17.45, t(124) = -4.96, p < 0.001$), and participants in the low anthropomorphic appearance group had low perceptions of anthropomorphism ($M_{low} = 3.63$, $SD = 1.61$) and participants in the high anthropomorphic appearance group had high perceptions of anthropomorphism ($M_{high} = 4.86$, $SD = 1.14$), indicating the validity of the anthropomorphic appearance manipulation test for AI products in the utility group.

For utility products, independent sample t-tests showed that low anthropomorphic appearance was more likely to motivate consumers to purchase compared to high anthropomorphic appearance ($M_{low} = 5.40$, $SD = 1.09$; $M_{high} = 4.73$, $SD = 1.77$; $t(146) = 2.75$, $p < 0.01$); low anthropomorphic appearance was more likely to increase consumers' brand evaluation compared to high anthropomorphic appearance ($M_{low} = 5.33$, $SD = 0.98$; $M_{high} = 4.79$, $SD = 1.77$; $t(146) = 2.30$, $p < 0.05$). The experimental results again verified hypothesis H1a.

For hedonic products, independent sample t-tests showed that high anthropomorphic appearance was more likely to motivate consumers to purchase compared to low anthropomorphic appearance ($M_{low} = 5.02$, $SD = 1.05$; $M_{high} = 5.51$, $SD = 0.79$; $t(124) = -2.98$, $p < 0.01$); high anthropomorphic appearance was more likely to increase consumers' brand evaluation compared to low anthropomorphic appearance ($M_{low} = 5.07$, $SD = 0.95$; $M_{high} = 5.54$, $SD = 0.87$; $t(124) = -2.86$, $p < 0.01$). The experimental results again verified hypothesis H1b.

(3) Analysis of mediating effects

Independent samples *t*-test results indicated that for utilitarian products, low anthropomorphic appearance elicited stronger perceived usefulness of consumption compared to high anthropomorphic appearance ($M_{low} = 5.56$, $SD = 1.03$; $M_{high} = 4.96$, $SD = 1.53$; $t(146) = 2.79$, $p < 0.01$). For hedonic products, a high anthropomorphic appearance elicited stronger perceived entertainment for consumption compared to a low anthropomorphic appearance ($M_{low} = 5.08$, $SD = 0.96$; $M_{high} = 5.54$, $SD = 0.88$; $t(124) = -2.82$, $p < 0.01$).

Mediation analysis of the effect of the anthropomorphic appearance of the utility group on consumer purchase intention and brand evaluation was performed, modeling the pathway anthropomorphic appearance-perceived usefulness-purchase intention/brand evaluation, using the Process 4.0 plug-in in SPSS with Model 4, 5000 Bootstrap to test the intermediary effect. The results showed that anthropomorphic appearance had a significant negative effect on perceived usefulness ($b = -0.60$, $SE = 0.21$, $p < 0.01$), perceived usefulness had a significant positive effect on purchase intention ($b = 0.95$, $SE = 0.05$, $p < 0.001$), and anthropomorphic appearance had a significant negative indirect effect on purchase intention ($b = -0.57$, $p < 0.01$) when consumer purchase intention was the dependent variable. 95% confidence interval CI: [−0.99, −0.16], excluding 0); in addition, the total effect of anthropomorphic appearance on purchase intention was also significant ($b = -0.67$, 95% confidence interval CI: [−1.14, −0.19], excluding 0). The indirect effect of anthropomorphic appearance on brand evaluation was also significant and negative when consumer brand evaluation was the dependent variable ($b = -0.57$, 95% confidence interval CI: [−1.02, −0.16], excluding 0). Hypothesis H2 was tested.

A mediation analysis of the effect of the anthropomorphic appearance of the hedonic group on consumer purchase intention and brand evaluation was conducted, modeling the pathway anthropomorphic appearance-perceived entertainment-purchase intention/brand evaluation, using the Process 4.0 plug-in in SPSS with Model 4, 5000 Bootstrap to test the intermediary effect. The results showed that anthropomorphic appearance had a significant positive effect on perceived entertainment ($b = 0.29$, $SE = 0.05$, $p < 0.001$), perceived entertainment had a significant positive effect on purchase intention ($b = 0.62$, $SE = 0.07$, $p < 0.001$), and anthropomorphic appearance had a significant positive indirect effect on purchase intention ($b = 0.18$, $p < 0.001$) when consumer purchase intention was the dependent variable. 95% confidence interval CI: [0.11, 0.25], excluding 0); in addition, the total effect of anthropomorphic appearance on purchase intention was also significant ($b = 0.32$, 95% confidence interval CI: [0.22, 0.42], excluding 0). The indirect effect of anthropomorphic appearance on brand evaluation was also significant and positive when consumer brand evaluation was the dependent variable ($b = 0.20$, 95% confidence interval CI: [0.12, 0.28], excluding 0). Hypothesis H3 was tested.

(4) Summary

The results of Experiment 2 show that for practical AI products, consumer-perceived usefulness mediates the effect of anthropomorphic appearance on consumer purchase intention and brand evaluation; for hedonic smart products, consumer-perceived entertainment mediates the effect of anthropomorphic appearance on consumer purchase intention and brand evaluation.

4.6. Experiment 3

The purpose of Experiment 3 was to examine the effect of the degree of anthropomorphic appearance of practical AI products on consumers' purchase intention and brand evaluation, to explore the mediating role of perceived usefulness in the main effect, and to introduce the moderating variable of intelligence level to verify the mechanism of the effect of perceived usefulness.

(1) Experimental design and participants

Experiment 3 used a one-way between-groups design manipulating the degree of anthropomorphic appearance (low vs. high) of a pragmatic AI product. First, participants rated the degree of anthropomorphic appearance of the group after reading the corresponding experimental material for each group as well as the product image on the anthropomorphic appearance scale (as in Experiment 1, Cronbach's $\alpha = 0.904$). Next, participants filled out the perceived usefulness scale (same as Experiment 2, Cronbach's $\alpha = 0.941$). Then, participants filled in the scale about the intelligence level of AI products according to their needs, the scale was translated from Li et al. (2017) shown in Table 1, Cronbach's $\alpha = 0.933$. Finally, participants filled in the purchase intention scale (Cronbach's $\alpha = 0.883$) and the brand evaluation scale (Cronbach's $\alpha = 0.882$) and reported demographic information.

(2) Experimental result

The results of the manipulation test for product anthropomorphic appearance showed that the low anthropomorphic appearance group rated anthropomorphic appearance significantly lower than the high anthropomorphic appearance group ($F(1,200) = 30.34$, $t(200) = -7.42$, $p < 0.001$), and participants in the low anthropomorphic appearance group had a low level of anthropomorphic perception ($M_{low} = 3.31$, $SD = 1.96$) and participants in the high anthropomorphic appearance group had a high level of anthropomorphic perception ($M_{high} = 5.09$, $SD = 1.40$), indicating the validity of the anthropomorphic appearance manipulation test for AI products in the experiment.

The results of the independent samples *t*-test indicated that for utility products, low anthropomorphic appearance was more likely to stimulate consumers' purchase intentions compared to high anthropomorphic appearance ($M_{low} = 5.53$, $SD = 1.08$; $M_{high} = 5.20$, $SD = 1.27$; $t(200) = 2.04$, $p < 0.05$); low anthropomorphic appearance was more likely to increase consumers' brand evaluation compared to high anthropomorphic appearance ($M_{low} = 5.47$, $SD = 1.02$; $M_{high} = 5.10$, $SD = 1.26$; $t(200) = 2.29$, $p < 0.05$). The experimental results again verified hypothesis H1a.

(3) Analysis of mediating effects with regulation

The results of the independent samples *t*-test indicated that for utilitarian products, low anthropomorphic appearance elicited stronger perceived usefulness for consumption compared to high anthropomorphic appearance ($M_{low} = 5.83$, $SD = 0.99$; $M_{high} = 5.20$, $SD = 1.57$; $t(200) = 3.43$, $p < 0.001$).

A moderated mediation analysis of the effect of the anthropomorphic appearance of practical AI products affecting consumer purchase intention and brand evaluation was conducted with a model pathway of anthropomorphic appearance-perceived usefulness-purchase intention/brand evaluation, with the moderating variable being the level of intelligence, using the Process 4.0 plug-in in SPSS, using Model 7 The mediating effect with moderation was examined by using the Bootstrap method with 5000 cycles. The results found that, in terms of consumer purchase intention, the indirect effect of low intelligence level on perceived usefulness between anthropomorphic appearance and purchase intention was significant ($b = -0.18$, 95% confidence interval CI: [−0.32, −0.10], excluding 0); the indirect effect of high intelligence level on perceived usefulness was also significant ($b = -0.10$, 95% confidence interval CI: [−0.17, −0.02], excluding 0). 0.17, −0.02], excluding 0); the moderating effect was not significant (95% confidence interval CI: [−0.002, 0.165], including 0). In terms of consumer brand evaluation, the moderating effect of intelligence level was also insignificant (95% confidence interval CI: [−0.002, 0.161], inclusive). This suggests that for practical AI products, the level of intelligence does not moderate the effect of anthropomorphic appearance on perceived usefulness, which in turn affects consumers' purchase intention and brand evaluation. Hypothesis H4a was verified (see Table 3).

4.7. Experiment 4

The purpose of Experiment 4 was to examine the effect of the degree of anthropomorphic appearance of hedonic AI products on consumers' purchase intention and brand evaluation, to explore the mediating role of perceived entertainment in the main effect, and to introduce the moderating variable of intelligence level to verify the mechanism of the effect of perceived entertainment.

(1) Experimental design and participants

Experiment 4 used a one-way between-group design manipulating the degree of anthropomorphic appearance of hedonic AI products (low vs. high). First, participants rated the degree of anthropomorphic appearance of the group after reading the corresponding experimental material for each group as well as the product image on the anthropomorphic appearance scale (as in Experiment 1, Cronbach's $\alpha = 0.849$). Next, participants filled out the scale of perceived entertainment (same as Experiment 2, Cronbach's $\alpha = 0.846$). Then, participants filled in the scale about the intelligence level of smart products according to their needs (same as Experiment 3, Cronbach's $\alpha = 0.929$). Finally, participants filled out the purchase intention scale (Cronbach's $\alpha = 0.838$) and the brand evaluation scale (Cronbach's $\alpha = 0.846$) and reported demographic information.

Table 3
Moderating mechanism of intelligence level on perceived usefulness.

Mediating effects with regulation (Utilitarian Products)				
		Effect Value	95% confidence interval	
			LLCI	ULCI
Purchase intention	Perceptual usefulness (low intelligence)	−0.1841	−0.3167	−0.1014
	Perceptual usefulness (high intelligence)	−0.1012	−0.1650	−0.0246
Brand evaluation	Perceptual usefulness (low intelligence)	−0.1820	−0.3133	−0.0985
	Perceptual usefulness (high intelligence)	−0.1001	−0.1661	−0.0230

(2) Experimental result

The results of the manipulation test for product anthropomorphic appearance showed that the low anthropomorphic appearance group rated anthropomorphic appearance significantly lower than the high anthropomorphic appearance group ($F(1,200) = 6.70$, $t(160) = -6.28$, $p < 0.001$), and participants in the low anthropomorphic appearance group had a low level of anthropomorphic perception ($M_{low} = 3.70$, $SD = 1.65$) and participants in the high anthropomorphic appearance group had a high level of anthropomorphic perception ($M_{high} = 5.13$, $SD = 1.20$), indicating the validity of the anthropomorphic appearance manipulation test for AI products in the experiment.

The results of the independent samples *t*-test indicated that for hedonic products, high anthropomorphic appearance was more likely to stimulate consumers' purchase intention compared to low anthropomorphic appearance ($M_{low} = 4.90$, $SD = 1.26$; $M_{high} = 5.61$, $SD = 0.93$; $t(160) = -4.09$, $p < 0.001$); high anthropomorphic appearance was more likely to increase consumers' brand evaluation compared to low anthropomorphic appearance ($M_{low} = 5.06$, $SD = 1.20$; $M_{high} = 5.63$, $SD = 1.03$; $t(160) = -3.24$, $p < 0.001$). The experimental results again verified hypothesis H1b.

(3) Analysis of mediating effects with regulation

The results of the independent samples *t*-test indicated that for hedonic products, a high anthropomorphic appearance elicited stronger perceived entertainment for consumption compared to a low anthropomorphic appearance ($M_{low} = 5.05$, $SD = 1.16$; $M_{high} = 5.69$, $SD = 0.89$; $t(160) = -3.97$, $p < 0.001$).

A moderated mediation analysis of the effect of the anthropomorphic appearance of hedonic AI products on consumer purchase intention and brand evaluation was conducted, modeling the pathway anthropomorphic appearance-perceived entertainment-purchase intention/brand evaluation, still using the Experiment 2 approach to test the moderated mediation effect. The results found that the indirect effect of low intelligence on perceived entertainment between anthropomorphic appearance and purchase intention was not significant for consumer purchase intention ($b = 0.94$, 95% confidence interval CI: [−0.03, 0.18], including 0); the indirect effect of high intelligence on perceived entertainment was significant ($b = 0.22$, 95% confidence interval CI: [0.11, 0.33], excluding 0); and the indirect effect of high intelligence on perceived usefulness was significant ($b = 0.22$, 95% confidence interval CI: [0.11, 0.33], including 0).], excluding 0); and a significant moderating effect (95% confidence interval CI: [0.01, 0.18], excluding 0). The moderating effect of intelligence level was also significant in consumer brand evaluation (95% confidence interval CI: [0.01, 0.19], excluding 0). This suggests that for hedonic AI products, the level of intelligence moderates the effect of anthropomorphic appearance on perceived entertainment, which in turn affects consumers' purchase intention and brand evaluation. Hypothesis H4b was tested (see Table 4).

5. Conclusion and discussion

5.1. Research findings

This paper explores the mechanism by which the anthropomorphic appearance of AI products and product type jointly affect consumers' purchase intention and brand evaluation through four experiments. Experiment 1 verified that in a utility AI context, low anthropomorphic appearance significantly increased consumers' purchase intention and brand evaluation compared to high anthropomorphic appearance, while

Table 4
Moderating mechanism of intelligence level on perceived entertainment.

Mediating effects with regulation (Hedonic Products)				
		Effect Value	95% confidence interval	
			LLCI	ULCI
Purchase intention	Perceptual entertainment (low intelligence)	0.0941	−0.0334	0.1783
	Perceptual entertainment (high intelligence)	0.2153	0.1056	0.3274
Brand evaluation	Perceptual entertainment (low intelligence)	0.0978	−0.0341	0.1812
	Perceptual entertainment (high intelligence)	0.2239	0.1169	0.3377

in a hedonic AI context, high anthropomorphic appearance significantly increased consumers' purchase intention and brand evaluation compared to low anthropomorphic appearance. Experiment 2 explored the mediating role of perceived usefulness and perceived entertainment under different product types, specifically, perceived usefulness mediated in the path of tangible products, while perceived entertainment mediated in the path of hedonic products. Experiment III verified that the introduced level of intelligence did not effectively moderate the mediating effect of perceived usefulness under real products. Experiment 4 verified that under hedonic products, the level of intelligence significantly moderated the mediating effect of perceived usefulness and further influenced consumers' purchase intention and brand evaluation.

5.2. Theoretical contributions

First, this paper enriches the empirical research on the appearance attributes of artificial intelligence products in anthropomorphic marketing. Although existing scholars believe that anthropomorphic marketing is an important element in the field of consumer behavior and that anthropomorphic marketing influences consumers' attitudes, behaviors, and even perceived psychology by manipulating and satisfying their anthropomorphic tendencies, the current empirical studies on the influence of anthropomorphic products on consumer behavior are still not comprehensive enough, such as the consumer behavior caused by anthropomorphic products facing different types of consumers and different product types (Pillai et al., 2020). This paper systematically explores the impact of the anthropomorphic appearance of AI products on consumer behavior, which also provides a theoretical basis for companies to implement AI product anthropomorphic strategies more effectively.

Second, this paper explores the interaction between the anthropomorphic appearance of AI products and product type and explains the behavior of consumers based on different motivational needs. This paper introduces product type into the overall research framework to explore the process of consumer motivation for practical and hedonic products and then clarifies the conditions for implementing anthropomorphic strategies for AI products.

Finally, this paper verifies the mediating role of perceived usefulness and perceived entertainment in the influence of AI products on consumers' purchase intention and brand evaluation from the perspective of consumers' emotions, thus explaining the role of consumers' intrinsic drivers in purchasing different types of AI products. In addition, this paper further refines the impact on consumers under different consumption types through the moderating variable of intelligence level, which enriches the research on anthropomorphic marketing of AI products.

5.3. Practical significance

This paper is instructive for the marketing application of AI products in business practice. With the rapid development of AI technology, individual consumers increasingly prefer smart home products, and how implementing different strategies for different types of smart products requires specific analysis.

First, in the implementation of an anthropomorphizing strategy for intelligent products, the product attributes of the product should be clarified, which requires a preliminary survey of consumers to clarify whether the product belongs to the hedonistic or practical type. Hedonic AI products should focus on the characteristics of product anthropomorphism, companies can give priority to the design of anthropomorphic appearance, while practical intelligent products should focus on the quality of the product itself and practical functions, to achieve the practical effect expected by consumers before further consideration of anthropomorphic appearance design.

Second, different types of AI products should be differentiated marketing with different needs of consumers. For consumers who care about quality and durability, company should avoid promoting products with a high degree of anthropomorphism to them and seize the psychology of consumers' perceived usefulness to make them better perceive the function and utility of the products; while for consumers who are concerned about a sensory experience such as design, company can promote products with a high degree of anthropomorphism to them and use the psychology of consumers' perceived entertainment to better convey the perception of the products to make consumers' purchase decisions. For consumers who are concerned about design and other sensory experiences, company can promote products with a high degree of anthropomorphism and make use of consumers' psychology of perception of entertainment to better convey their perception of products and make their purchase decisions.

Third, the level of product intelligence is also particularly important, a high level of intelligence can cope with more complex and changing scenarios (Longoni et al., 2019), but for the utilitarian needs of consumers, it does not need a high level of intelligence, just the level of intelligence to complete the original task can be, and this is the opposite of the hedonistic needs of consumers, the pursuit of pleasure consumers often hope that the higher the level of intelligence of the product, the better, because A high level of intelligence means that the use of the process can bring unimagined good experiences and positive emotions.

5.4. Research limitations and prospects

(1) Research limitations

First, the use of experimental materials is relatively single. This paper only chose the floor mopping robot as the actual product and the smart speaker as the hedonic product, and whether there will be differences in the research results for other products need to be further verified.

Second, the industry selection of AI products is relatively single. In this paper, only AI products in the home industry were selected during the experiment, while artificial intelligence products are found in various industries such as tourism, catering, medical and industrial, so anthropomorphizing intelligent products in different industries may produce different results.

Third, the effect of the experimental scenario. Although the scenario simulation method used in this paper provided participants with relevant pictures and helped them conceptualize the corresponding scenarios as much as possible, the inability to show the actual scenarios would inevitably cause bias in the experiment.

(2) Future Research

First, the choice of experimental materials is enriched. Future research can select different practical and hedonic products to improve the empirical study of AI products and can classify the product types according to different criteria to carry out corresponding research.

Second, explore different anthropomorphizing perspectives. Future

research cannot be limited to the study of the anthropomorphizing of AI products at the external level, but can also further explore the impact of different perspectives of AI product anthropomorphizing on consumers from the internal level, social dimensions, and other perspectives.

Third, different perceptions of consumers are explored. Future research could consider the impact of other consumer perceptions, which could be studied accordingly based on perceptions of trust at the individual level, risk of privacy invasion, and sense of belonging at the social level.

Declaration of competing interest

This piece of the submission is being sent via mail.

Data availability

No data was used for the research described in the article.

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