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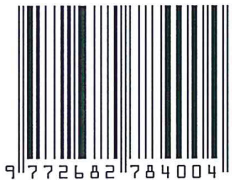

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A REVIEW OF THE EFFECTS OF ANTHROPOMORPHIC DESIGN ON CONSUMER EMOTIONS

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ABSTRACT

In recent years, anthropomorphic design has received increasing attention in marketing and product design. By imbuing inanimate objects with anthropomorphic features in the form of visuals, language, and symbols, anthropomorphic design can trigger consumers' empathy and pleasure and then significantly influence their attitudes and behaviors. Previous studies have shown that anthropomorphic design not only affects consumers' emotional responses in a variety of scenarios but also reduces loneliness and negative emotions by triggering emotional connections and social bonds, thus enhancing overall well-being. However, the effects of anthropomorphic design are moderated by individual consumer differences and situational factors. Therefore, this research review summarizes the development of anthropomorphic design, the dimensions of the variables, and the relationships between the variables. It summarizes the mechanisms of anthropomorphic design's effects on consumer emotions. It also analyzes the main research trends, problems, and limitations in the existing literature. On this basis, the paper finally looks into the future research directions in this field and makes some suggestions for practitioners and researchers.

1. Introduction

Anthropomorphism, defined as "seeing the human in non-human forms" (Aggarwal & McGill, 2007), has been a long-standing practice, with roots in ancient human culture where it was

applied to nature, flora, fauna, deities, and other non-human entities. However, scholarly attention to the psychomechanical processes and boundary effects of anthropomorphism has only emerged in recent decades (Khan et al., 2023). Recently, the scope of anthropomorphism has expanded, not only serving as a communication strategy in marketing but also as a manipulable and measurable variable that impacts consumer emotions, perceptions, attitudes, and behaviors (Sharma & Rahman, 2022). Through visual design, verbal interaction, and the incorporation of human-like traits such as personality and responsiveness, brands and products can be transformed into anthropomorphic entities (Ma et al., 2023). Examples include facial features in automobile headlights and grilles, the human curves of Coke bottles, M&M candies, and Mr. Clean. Prior research has demonstrated that brands and products with anthropomorphic design elements, such as visual and verbal cues, are more likely to evoke positive emotions in consumers compared to non-anthropomorphic ones (De Bondt et al., 2018), enhance product favorability (Shirai, 2023), and improve brand attitudes (Hudson et al., 2016). Additionally, anthropomorphic artificial intelligence agents leverage voice cues to increase consumer engagement (Moussawi et al., 2021), while anthropomorphic social robots have been shown to alleviate loneliness (Li & Sung, 2021). Furthermore, anthropomorphic design has been found to increase prosocial behavior by influencing consumers' emotional perceptions (T. Chen et al., 2021; Tam et al., 2013), and reduce social exclusion (Mourey et al., 2017). According to Kim (2020), anthropomorphism creates a sense of comfort for audiences, as if they were in a real social environment, thereby reducing communication stress and resistance.

As research intensifies and new scenarios emerge, the adoption of anthropomorphic design in certain contexts may not always yield favorable outcomes (Barney et al., 2022). For instance, Chang (2023) found that in medical contexts, the use of anthropomorphic design in products, packaging, or advertising can negatively impact consumers' product evaluations. Previous studies have demonstrated that inappropriate use of anthropomorphism can trigger negative reactions (Ding et al., 2022), lead to resistance in consumer behavior (Niemyjska et al., 2021), damage brand image (Puzakova et al., 2013), and that excessive anthropomorphism, particularly in artificial intelligence, may provoke the "Uncanny Valley" phenomenon (Blut et al., 2021). In addition, the lack of extensive empirical research has left scholars with an ambiguous understanding of the boundary effects of anthropomorphic design in consumer contexts, contributing to a range of conflicting findings (Khan et al., 2023).

2. Overview of Anthropomorphism

2.1 The concept of anthropomorphism

Anthropomorphism is a universal cognitive process, as well as a rhetorical device and specific metaphor in the development of human language. When used as a psychological construct that can be manipulated and measured, it refers to the assignment of human characteristics, motives, intentions, or mental states to non-human objects (Epley et al., 2007). Anthropomorphism can manifest as a process, a tendency, or as the degree to which non-human objects exhibit human-like characteristics (Gursoy et al., 2019). The application of anthropomorphism has expanded beyond religious theology to include fields such as environmental science (Ding et al., 2022), artificial intelligence (Xie et al., 2023), consumer behavior (Khan et al., 2023), branding (Ma et al., 2023), and product design (Aggarwal & McGill, 2007). Various scholars have provided different definitions of anthropomorphism across diverse contexts (see Table 1).

Table 1
The concept of anthropomorphism

Context	Definitions	Author(s) (year)
Social Psychology	"The tendency to imbue the real or imagined behaviour of non-human agents with human-like characteristics, motivations, intentions, or emotions" (p. 864)	(Epley et al., 2007)
Marketing	"Anthropomorphism, or imbuing nonhuman entities with human traits". (p. 1)	(Yang et al., 2020)
artificial intelligence (AI)	"Anthropomorphism is the extent to which a character has the appearance or behavioural attributes of a human being". (p. 787)	(Murphy et al., 2019)
Product design	"Anthropomorphism is "seeing the human in non-human forms"	(Aggarwal & McGill, 2007)

Anthropomorphism is fundamentally an interdisciplinary and multi-perspective field of study (Sharma & Rahman, 2022). It is not merely a description of appearance, behavior, or personality but involves a process of imbuing non-human objects with uniquely human traits, including consciousness, emotions, and higher-order cognitive abilities such as analysis and imagination (Epley et al., 2007). Anthropomorphic design focuses on endowing non-human objects, such as brands or products, with human-like characteristics, behaviors, or emotions, enabling consumers to interact with them as if they were human (Aggarwal & McGill, 2007). This design approach encompasses not only natural attributes (e.g., appearance, expression, decoration, verbal communication) but also spiritual attributes (e.g., emotions, thoughts, will) and social attributes (e.g., personality, communication, interaction).

2.2 Mechanisms and tendencies of anthropomorphism

According to Guthrie (1997), humans have a natural inclination to assign human traits to the objects around them. Epley (2007) extends this theory by proposing that anthropomorphism occurs through a specific cognitive process, defined by three psychological factors that motivate anthropomorphic phenomena, known as the SEEK model. The first factor, accessibility of anthropocentric knowledge, suggests that when people encounter unknown or uncertain entities, they tend to use pre-existing human knowledge to understand and explain these entities, thereby triggering anthropomorphism. For example, a smiling cartoon character on packaging may lead consumers to associate the smile with human friendliness, evoking a positive emotional response. The second factor, effectance motivation, emphasizes the human desire to effectively understand and control their surroundings through anthropomorphism. When consumers are presented with anthropomorphic designs featuring human-like personality traits, they may feel more confident and in control, reducing uncertainty and increasing their willingness to interact with the product. The third factor, sociality motivation, addresses the human need for social contact and belonging. Research has shown that individuals experiencing loneliness are more likely to anthropomorphize and respond positively to anthropomorphic designs (Epley et al., 2007). Additionally, Tam (2013) argues that a connection with nature can enhance well-being by fulfilling the need for social interaction. As individuals with strong needs for belonging and social connection are more inclined to seek out anthropomorphic cues, they are more likely to use anthropomorphization to compensate for social deficiencies (Feng, 2016). Thus, anthropomorphism is an automatic mental process driven by three fundamental human needs: the need to understand the world, the need to connect with others, and the need to maintain a sense of belonging (Yang et al., 2020).

Aggarwal & McGill (2007) first introduced the cognitive schema congruence theory to the field of anthropomorphic design. This theory suggests that when the characteristics of a product align with the activated schema from consumers' previous human memories, they will respond positively and emotionally to the product. Feng (2016) indicates that consumers who are in a marginal state of exclusion are more inclined to engage with anthropomorphic products. This is because anthropomorphic products possess stronger pro-social attributes, which are more likely to foster an emotional connection with consumers and generate positive emotions. As a result, these consumers are driven to actively seek out anthropomorphic cues and view the brand or product as a "friend" or "partner" rather than merely an object of exchange. The differences in anthropomorphic tendencies may stem from variations in individuals' cultural backgrounds, cognitive needs, self-esteem levels, and other factors (Epley et al., 2007). Therefore, the essence of anthropomorphic design lies in influencing consumer emotions, perceptual patterns, and behaviors by manipulating and satisfying their anthropomorphic tendencies (Khan et al., 2023).

3 Dimensions of Anthropomorphic Design

The current dimensional division of anthropomorphic design has attracted significant research interest in fields such as marketing, artificial intelligence, and pro-social behavior (see Table 2). For instance, Adam (2021) demonstrated that anthropomorphic verbal cues by an AI agent system can induce positive emotional responses in consumers. Similarly, Verhagen (2014) found that the anthropomorphic visual cues of virtual customer service can trigger consumers' reactions akin to real social communication and enhance their perception of personalization, thereby increasing user satisfaction (Kim et al., 2020). However, due to the limitations inherent in single-dimensional approaches, recent research has increasingly focused on two- and multi-dimensional anthropomorphic manipulations. Studies have shown that incorporating multiple anthropomorphic design cues, such as visual, verbal, auditory, and emotional cues, tends to elicit more positive consumer responses compared to non-anthropomorphic or low-level anthropomorphic designs. Additionally, Wang (2014) proposed two communication dimensions, anthropomorphic impression cues and social interaction cues, based on grounded theory. The anthropomorphic impression encompasses external cues like human-like appearance, movement, and language, while social interaction pertains to internal cues such as personality, emotions, and even the perception of a soul. Similar classifications have been made in the literature, distinguishing between Anthropomorphism and Non-Anthropomorphism (Kim et al., 2020), high anthropomorphism and low anthropomorphism (H. Chen et al., 2024), visual and cognitive anthropomorphism (Barney et al., 2022), physical and psychological anthropomorphism (Niemyjska et al., 2021), internal and external anthropomorphism (Chu et al., 2019), as well as abstract and present anthropomorphism (Newton et al., 2017).

Table 2
Dimensions of Anthropomorphic Design

level	The dimension	Author(s) (year)
Single-dimension	Anthropomorphism	(Adam et al., 2021) ; (Verhagen et al., 2014) ;
Two-dimension	Impressionistic cues; interactive cues	Wang (2014)
	Anthropomorphism vs. Non-Anthropomorphism	(Kim et al., 2020); (Ma et al., 2023); (Shirai, 2023)
	Anthropomorphism (high vs. low)	(H. Chen et al., 2024)
	Anthropomorphic cues (visual vs. verbal)	(Sah & Peng, 2015)
	Anthropomorphism (visual vs. cognitive)	(Barney et al., 2022)

	Anthropomorphism (physical vs. psychological)	(Niemyjska et al., 2021)
	Anthropomorphism (internal vs. external)	(Chu et al., 2019)
	Anthropomorphic cues (present vs. absent)	(Newton et al., 2017)
Multi-dimension	Visual cues; Identity cues; emotional cues; auditory cues	(Xie et al., 2023)
	Visual cues; Auditory cues; Visual x Auditory cues	(Yuan & Dennis, 2019)
	Physical; Emotional; Personality	(Alabed et al., 2022)
	Visual; Moral; Cognitive; Emotion	(Golossenko et al., 2020) ; (Dabiran et al., 2024)

The dimensions of anthropomorphic design have also been categorized across multiple dimensions in recent research. For instance, Yuan & Dennis (2019) demonstrated that anthropomorphic product displays in online auction contexts can influence consumers' purchase intentions through visual, auditory, and combined cues, with visual anthropomorphic design playing a more significant role. Additionally, artificial intelligence agents have been categorized into physical, emotional, and personality dimensions for anthropomorphic manipulation, establishing a connection between self-consistency and self-artificial intelligence integration (Alabed et al., 2022). Xie (2023) further categorized anthropomorphic cues for smart home assistants into visual, identity, emotional, and auditory dimensions, and developed a dual-path model to examine the influence of anthropomorphic design on interaction satisfaction. Moreover, Dabiran (2024) explored how followers' perceptions of trustworthiness and quasi-social relationships with virtual influencers, as well as their purchase intentions, are influenced by categorizing virtual influencers on social media into anthropomorphic dimensions such as appearance, moral virtues, cognitive experiences, and conscious emotions. However, it is important to note that some multidimensional scales of anthropomorphic design have not been empirically tested as extensively as single-dimensional scales.

4 The effect of anthropomorphic design on consumer emotions

The process by which anthropomorphic design influences consumer mood is complex and multidimensional, shaped by various factors, including the context of the anthropomorphic stimuli and the variables linking anthropomorphism to consumer mood (see Figure 1). Anthropomorphic design involves nonhuman objects, such as brands, products, advertisements, natural environments, and artificially intelligent agents, engaging in social interactions with consumers (Khan et al., 2023). In marketing, anthropomorphic design is used to mimic human external features, internal perceptions, and social behaviors, thereby enhancing consumers' perceptions of real interpersonal emotional communication patterns (Golossenko et al., 2020). This perception can be cultivated through anthropomorphic design cues within the marketing mix, including product design attributes, brand image, pricing, packaging, celebrity endorsements, and even the conversational style of personnel (H. Chen et al., 2024). Yuan & Dennis (2019) found that giving a product human-like attributes, such as appearance or voice, can increase consumers' perceived value and evoke positive emotions towards the product. Additionally, when a brand, product image, or advertisement is anthropomorphized, consumers may attribute human qualities to these objects, fostering emotional intimacy (Chu et al., 2019). Anthropomorphic design can also enhance consumers' perceptions of social interactions, leading to positive consumer responses (Kim et al., 2020). For instance, using anthropomorphic imagery or scenarios in advertisements can capture viewers' attention, evoke warmth (Jeong & Kim, 2021), build trust, and create psychological closeness (H. Chen et al., 2024). These emotionally positive responses contribute to increased brand favorability, which subsequently encourages consumption behavior (Jeong & Kim, 2021). Furthermore, Chen (2021) study indicated that anthropomorphic product design can elicit empathetic responses from consumers, which may help reduce food waste.

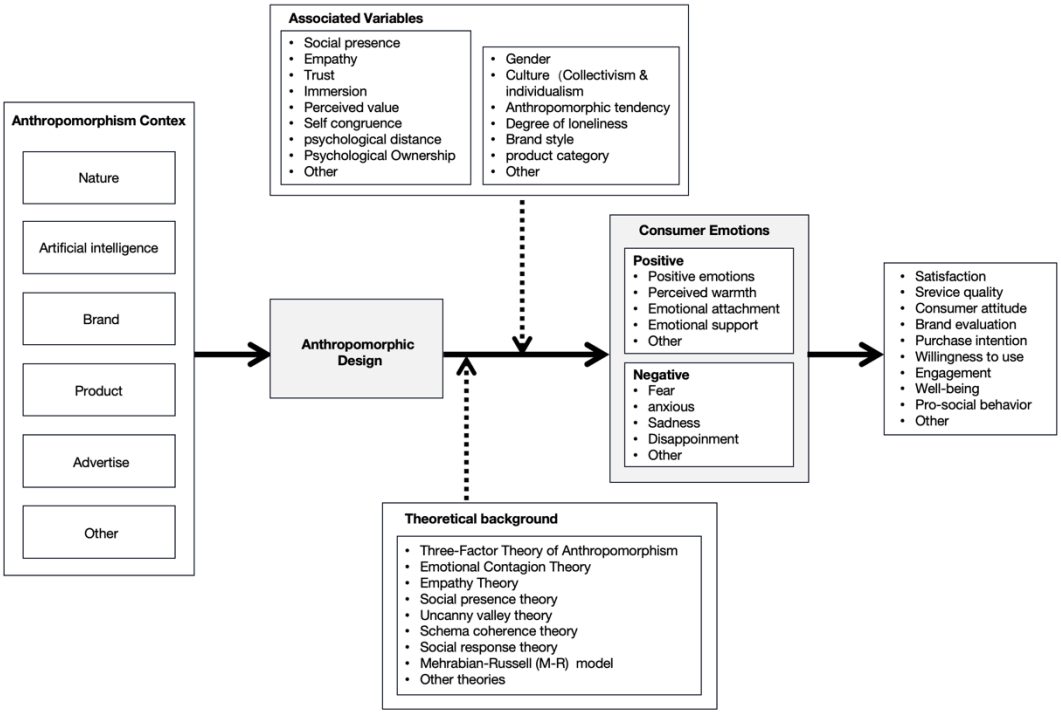

Figure 1. the effect of anthropomorphic design on consumer emotions

Previous research indicates that incorporating anthropomorphic design cues in nature can foster an emotional connection between consumers and the environment, thereby enhancing their willingness to protect it (Tam et al., 2013). Similarly, anthropomorphic design can improve consumers' emotional experiences by making non-human objects more comprehensible and easier to use. For instance, anthropomorphic cues such as friendly voices, human-like expressions, or anthropomorphic interfaces in AI agents or smart home products can reduce users' technological fear, increasing comfort and satisfaction (Xie et al., 2023). Furthermore, anthropomorphic design in AI not only reduces cognitive load and aligns with consumers' sense of self-consistency with AI, thus triggering positive emotional responses (Alabed et al., 2022) but also enhances the overall user experience (Chiang et al., 2022). However, the effect of anthropomorphic design on consumer emotions is influenced by cultural context. For example, Baskentli (2023) study showed that collectivist consumers prefer anthropomorphic products more than non-collectivist consumers. This preference is not only related to individual anthropomorphic tendencies but also to the type of product, as Feng (2016) study revealed that hedonic products are more suitable for anthropomorphic communication than utilitarian products. In addition, anthropomorphic designs do not always have a positive impact on consumer emotions. In some cases, excessive or inappropriate anthropomorphic design may trigger negative consumer emotions such as fear, embarrassment, discomfort, or scepticism (Ding et al., 2022). These negative emotions may stem from the fact that the anthropomorphic object does not behave in a way that is consistent with consumer expectations or social norms, leading to consumer resistance to the product or brand. Thus, the mechanisms and boundary effects of anthropomorphic design on consumer emotions are complex. While it can enhance emotional connection, user experience, and reduce loneliness and negative emotions by fostering emotional bonds and social

connections, thereby increasing overall well-being and encouraging positive consumer behaviors, and it can also trigger negative reactions. These negative outcomes may arise from anthropomorphic design styles, the degree of anthropomorphism that fails to meet consumer expectations, or differences in cultural backgrounds.

5 Conclusion

This study reviews the effects of anthropomorphic design on consumer emotions by analyzing the concepts and mechanisms of anthropomorphism, as well as the variable dimensions, revealing the mechanisms by which anthropomorphic design can improve emotional responses by triggering consumers' empathy, emotional resonance, intimacy, and perception of social presence in a variety of contexts. However, the efficiency of such designs is heavily determined by individual consumer preferences and situational conditions. In some cases, excessive or inappropriate anthropomorphic design may elicit negative emotions such as fear, embarrassment, discomfort, or scepticism, leading to consumer resistance to a brand or product; however, the literature in this area is too thin, so future research could focus more on why and how anthropomorphic design can have negative consequences. Second, because current anthropomorphic design dimensions are primarily focused on two-dimensional comparisons and lack multi-dimensional validation, future research should focus on multi-dimensional anthropomorphic design strategies that integrate multiple design elements such as visual, verbal, emotional, and interactive to further enhance consumers' emotional responses. Meanwhile, more relevant variables are being found and empirically evaluated in various scenarios to better understand the mechanism of anthropomorphic design effects on consumer emotions. Furthermore, empirical investigations must be undertaken in various cultural contexts to show the impact of cultural differences on customer responses, investigate further boundary constraints of anthropomorphic design, and explain its area of use. When applying anthropomorphic design, enterprises and designers must carefully consider the functional attributes of products as well as consumers' psychological expectations to avoid triggering negative emotions because of excessive anthropomorphism, which affects consumers' attitudes and behaviors.

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Conflict of Interest

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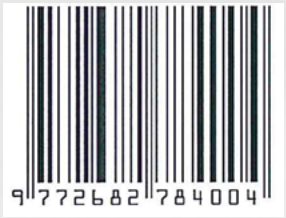

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