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# What Makes a Robot Cute? A Rapid Systematic Review of Design Elements for Social Robots

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# What Makes a Robot Cute? A Rapid Systematic Review of Design Elements for Social Robots

This paper presents a rapid systematic review of research on cuteness-oriented design, such as appearance and movement, in social robots. This review involved searching academic databases (IEEE Xplore, ACM, Science Direct, Springer, and Google Scholar) for publications up to December 2024. The review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and focused on studies on social robots that quantitatively evaluated human perceptions of robot cuteness. Ultimately, 27 articles met the inclusion criteria and were thematically categorized. These studies outline current research themes and future directions for cute robot design.

Keywords: Cuteness, Kawaii, Social Robot, Human-Robot Interaction, Systematic Review

## 1. Introduction

Our world is now awash with cute artefacts, and robotics is no exception. Many commercial robots feature deliberately endearing faces or bodies [1-3]. Even autonomous delivery robots in retail spaces are styled with cat-like facial expressions and other cute features [4]. The most widely cited guideline is Konrad Lorenz's baby schema (the prototypical features of infants or young animals [5, 6]), and several robots have successfully adopted these infant-like proportions.

Cuteness elicits diverse positive effects, such as encouraging smiles, caretaking, and nurturing behaviors [7-11]. Conversely, researchers have warned of a "dark side" of cuteness, promoting uncritical acceptance of technology and increased risk-taking [12, 13]. Although cuteness has both benefits and drawbacks, strong economic incentives and broad social acceptability suggest that cute robot designs will become increasingly prevalent.

In fact, the rapid growth of commercial service robots has shifted attention from purely technical performance to the socio-emotional cues that shape user impressions. In

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this context, Lorenz's baby schema and the Japanese notion of *kawaii* (a Japanese term referring to cuteness or endearment) [11, 14, 15] are frequently cited as design guidelines for eliciting cute responses in human-robot interaction (HRI). Following this context, robotics researchers have examined how cute designs influence the perception of social robots from multiple perspectives. For example, cute robots can enhance perceived likability [16], customer tolerance [17], and willingness to interact [18]. Another study focused on "*kawaii* engineering," which systematically analyzes user evaluations to reconstruct *kawaii* design principles [19]. From another perspective, a growing body of work highlights a "dark side" of cuteness, e.g., lowered user vigilance and heightened susceptibility to manipulation [20]. These observations highlight the need to identify the factors that modulate robot cuteness systematically.

Despite this accelerating interest, the literature remains fragmented: individual studies manipulated the specific designs (e.g., appearances) of social robots in an ad hoc manner. In other words, a systematic analysis of these studies would be useful for understanding the cuteness design of social robots. Investigating the effect of each modality on the perceived cuteness of social robots would provide robotics researchers and developers with actionable design insights for increasing or attenuating cuteness. Such a design policy would enable them to systematically test the effects of positive/negative perspectives of cuteness, different from rather ad-hoc design combinations. The basis of knowledge about the relationships between modalities and cuteness would also enable investigation of more complex design policies related to cuteness such as long-term interaction effects or social relationships effects between multiple people and robots.

Therefore, this study involved conducting a rapid systematic review of cuteness evaluations of social robots. By following the Preferred Reporting Items for Systematic

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Reviews and Meta-Analyses (PRISMA) guidelines [21], this study identifies and analyzes peer-reviewed studies that explicitly attempted to evoke cuteness by manipulating specific robot features. The review addresses the following research question: **Which modalities have been manipulated to enhance cuteness in social robots?**

## 2. Methods

### *2.1 Overview*

This review aims to 1) map current knowledge on how cuteness is designed, manipulated, and evaluated in the context of social robots, 2) outline methodological trends and common challenges, and 3) suggest promising directions for future work. This review was conducted in line with the PRISMA guidelines [21]. A flexible yet transparent procedure was adopted to capture the many facets of cuteness while keeping the process systematic and reproducible. Note that this review was not prospectively registered in PROSPERO or any other systematic review registry.

### *2.2 Criteria*

This study applied the following inclusion criteria to identify studies on cute design elements in social robots.

- Experimental studies that quantitatively evaluated cuteness-related impressions toward robots (e.g., questionnaire-based user studies). Studies that reported only qualitative data or no comparisons between conditions were excluded (e.g., studies that only reported free-response comments related to the cuteness topic [22]).

- Studies that manipulated specific robot design element(s) under controlled conditions to alter cuteness-related impressions. Therefore, this review process excluded studies that 1) changed multiple design elements in an ad-hoc manner (e.g., “cute” vs.

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“not cute” robots defined by the authors [23] and comparisons of selected different robots without any specific design policy about cuteness [24]), 2) focused solely on participant characteristics, not including robot characteristic (e.g., age-group comparisons [25]), or 3) investigated longitudinal effects (e.g., pre-/post-interaction comparisons [26]).

### *2.3 Strategy*

This review involved searching academic databases (IEEE Xplore, ACM, Springer, and Google Scholar) on July 31, 2024. The following Boolean strings were applied to titles, abstracts, and keywords: ("robot" AND ("human-robot interaction" OR "human-computer interaction") AND ("cuteness" OR "kawaii" OR "adorable" OR "endear") AND ("participants" OR "subjects") AND ("questionnaires" OR "metrics" OR "measures"). Only peer-reviewed articles published in English were retained. The search covered publications up to December 2024. The reason for deliberately retaining the Boolean operator AND among the keywords is to avoid an over-inclusive review process, thus jeopardizing the feasibility and reproducibility of the review [27].

### *2.4 Screening Processes*

Screening proceeded in two stages. First, titles and abstracts were evaluated against the inclusion criteria mentioned in Section 3.2. During this stage, the following papers were excluded: 1) design papers that discussed robot cuteness but provided no user data, 2) studies on cuteness in non-robotic artefacts (e.g., apps, toys, virtual agents, etc.), and 3) studies with titles and abstracts that did not mention cuteness-related topics. All papers that passed the first screening were reviewed in full.

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## 3. Results

### *3.1 Overview of Systematic Review*

The search identified 1,111 documents (Fig. 1). A total of 281 duplicates were removed before screening. A total of 830 records were screened, and 544 full texts were retrieved. After full-text assessment, 27 articles met the inclusion criteria. The modalities used to manipulate cuteness were visual (static: appearance, dynamic: motion), audio, and number (relationship) [28] (Fig. 2). Table 1 summarizes the included studies. Since expressing relationships requires multiple robots and dynamic visual or audio modalities, the table shows which modality was used to express relationships.

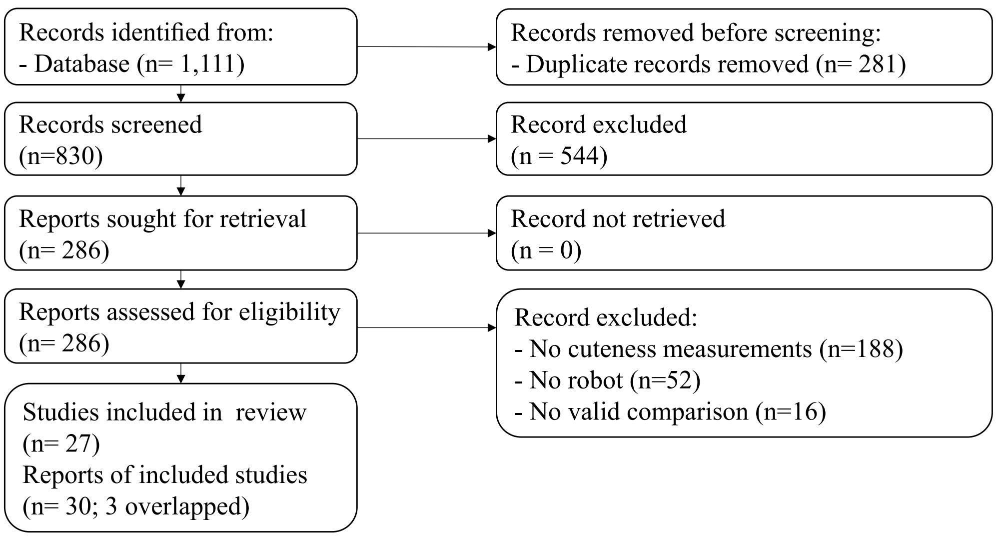


Fig. 1. PRISMA flow diagram for systematic review

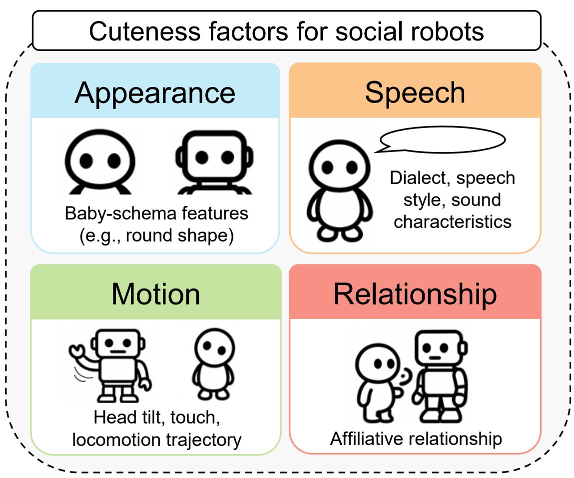


Fig. 2. The modalities used to manipulate cuteness in the studies

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Table 1. Summary of studies. In “Population” column, age M indicates average age. In “Factor” column, * indicates that study found significant effects in statistical analysis of cuteness-related evaluations. In “Metrics” column, * indicates that study mainly focused on cuteness-related evaluation.

| # | Author(s) | Year | Country | Population (n, age, gender ratio) | Factor | Metrics |
|---|---|---|---|---|---|---|
| [29] | Liberman-Pincu et al. | 2021 | Israel | Live: n:21, age: 10~11<br>Online: n:50, age: 8-14, F>M. | Appearance* | Cute |
| [30] | Hover et al. | 2021 | The Netherlands | Online: n:1,788 (comments) | Appearance* | Cute |
| [31] | Qie et al. | 2019 | China, Japan | Live: n:120, age M: 23.6 (30 Chinese), age M: 22.0 (30 Japanese), age M: 72.3 (30 Chinese), age M: 70.3 (30 Japanese). F=M. | Appearance* | Cute/ Kawaii* |
| [32] | Berque et al. | 2022 | U.S., Japan | Live: n:63 (27 Japan-culture group, F>M, 36 American-culture group), age M:20.9, M>F. | Appearance* | Cute/ Kawaii* |
| [33] | Nonomura et al. | 2015 | Japan | Live: n:42, age M:21.5, M only. | Appearance | Cute |
| [34] | Ishihara et al. | 2017 | Japan | Live: n:20. age M:21.8, M>F. | Appearance | Cute |
| [35] | Laohakangvalvit et al. | 2023 | U.S., Japan | Live: n=81 (40 Japanese, M=F, 40 Americans), age: 18-24, F>M. | Appearance* | Cute/ Kawaii* |
| [36] | Chen et al. | 2023 | China | Online: n:98, age: 26-41, 42+, M>F. | Appearance* | Cute |
| [37] | Yu et al. | 2022 | China | Online: n:284, age: 20-51, 52+, M>F. | Appearance* | Cute* |
| [38] | Beir et al. | 2016 | Belgium | Online: n:31 | Appearance* | Cute* |
| [39] | Song et al. | 2021 | China | Online: n:270, age M:36.5, M>F. | Appearance* | Babyishness* |
| [40] | Mara et al. | 2015 | Austria | Online: n:343, age:18-73, M>F.<br>Online: n:216, age:18 -67, M>F. | Motion* | Cute* |
| [41] | Shiomi et al. | 2024 | Japan | Online: n:177, age M:43.3, M>F.<br>Online: n:193, age M:42.6, F>M. | Motion* | Kawaii* |
| [42] | Matsumoto | 2018 | Japan | Live: n:7. | Motion | Cute |
| [43] | Sugano et al. | 2013 | Japan | Live: n:20, M>F. | Motion* | Kawaii* |
| [44] | Cooney et al. | 2014 | Japan | Live: n:25, age M:20.5, F>M. | Motion* | Cute |
| [45] | Ichino et al. | 2024 | Japan | Live: n:15, age: 20–22, M>F. | Motion* | Cute* |
| [46] | Randall et al. | 2023 | U.S. | Online: n:599, age:25-64, F=M. | Motion* | Cute |
| [47] | Okuda et al. | 2020 | Japan | Live: n:24, age:18-23, M>F. | Motion* | Cute |
| [48] | Okada et al. | 2022 | Japan | Live: n:42, age:21-49, F=M.<br>Online: n:124, age: 19-74, M>F. | Motion* | Kawaii* |
| [49] | Matsunaga et al. | 2021 | Japan | Live: n:15, age:21-42. | Motion | Kawaii |
| [50] | Ozeki et al. | 2023 | Japan | Live: n=84, age M:20, M>F. | Speech* | Cute |
| [51] | Kasuga et al. | 2017 | Japan | Live: n:22, age:9-84, F>M. | Speech | Cute |
| [52] | Iwamoto et al. | 2021 | Japan | Live: n:53 (who answered questionnaires) | Speech | Cute |
| [53] | Shiomi et al. | 2023 | Japan | Online: n:162, age M:41.8, M>F.<br>Online: n:179, age M=41.4, M>F.<br>Online: n:152, age M=41.4, M>F. | Relationship* (Motion) | Kawaii* |
| [54] | Shi et al. | 2024 | Japan | Live: n:24, age:61-83, F>M. | Relationship* (Speech) | Cute |
| [55] | Kimura et al. | 2024 | Japan | Online: n:161, age M=41.4, M>F. | Relationship* (Speech) | Kawaii* |

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### *3.2 Cuteness Manipulation (independent variables) and Key Findings*

#### *3.2.1 Appearance*

Among all design factors, visual appearance is by far the most frequently manipulated. These studies primarily examined the visual qualities of social-robot design. For example, Liberman-Pincu et al. examined how figure, abstraction level, color, material, and edge type influence perceived cuteness in photographs of real robots [29]. Hover et al. showed that moderately human-like robots are rated cuter than highly human-like robots [30]. Some studies analyzed the relationships between visual qualities and participant characteristics, such as culture, gender, and age. Qie et al. observed that Japanese seniors and young adults differ in their color preferences for cute robots [31]. In a cross-cultural study, Berque et al. found that rounded forms and colorful palettes were rated cuter than angular or greyscale variants by both Japanese and U.S. participants [32].

Some appearance-based manipulations produced no significant effects. Nonomura et al. manipulated design policies related to the adaptation gap but found no significant change in perceived cuteness [33]. Ishihara et al. developed a projection-mapping system for an anime-style robotic agent; however, the added visuals did not increase perceived cuteness [34].

Another major topic concerns size and proportions derived from the baby-schema concept. For example, Laohakangvalvit et al. reported gains when animal-like cues, rounded silhouettes, and short limbs were combined [35]. Chen et al. confirmed that accentuating baby-like facial features boosts perceived cuteness [36]. Yu et al. likewise found that a speaker-type robot designed with baby-schema features was rated cuter [37]. Beir et al. used genetic algorithms to optimize robot facial design and found that the

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resulting faces conformed to baby-schema features [38]. Song et al. parametrically varied facial babyishness and examined its relationship with perceived trustworthiness [39].

*3.2.2 Motion*

Motion is the second most studied design factor. One major line of work examines deliberate expressive motions. For example, Mara et al. varied head-tilt angle in static images and identified 20° as optimal [40]. Shiomi et al. extended this to video, showing that a 0.5–1.0 s tilt to the observer's right increased the feeling of *kawaii* [41]. Matsumoto claimed that a ball-type robot with rebellious behaviors was perceived as cuter than a robot with amenable or learning behaviors [42]. Sugano et al. tested locomotion trajectories on a vacuum robot and identified *bounce*, *dizzy*, and *spiral* as the three cutest patterns [43]. Cooney et al. manipulated robot personality profiles and found that an *Agape* (haptophilic) profile, behaving affectionately all the time, was perceived as cuter [44]. Ichino et al. reported that a blinking pattern comprising consecutive short closures was perceived as cuter [45]. From a slightly different perspective, Randall et al. showed that dynamic media (video or GIF) improve cuteness ratings over static photos, regardless of robot type [46].

The next topic is touch-related motion design. Okuda et al. showed that gaze shifts and subtle reactions to human touch increase perceived cuteness [47]. Okada et al. demonstrated that when a robot touches a physical object while describing it, observers attribute greater cuteness to that object [48]. However, Matsunaga et al. reported that wearing a shoulder-mounted robot produced no increase in perceived cuteness [49].

*3.2.4 Speech and relationship*

The remaining factors concern speech style and inter-robot relationships. Regarding speech, Ozeki et al. reported that robots speaking a local dialect are judged

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cuter than those using a standard accent in dialect-rich regions [50]. However, Kasuga et al. investigated positive and negative conversational scenarios with a robot and found no significant effect on perceived cuteness [51]. Iwamoto et al. compared two recommendation styles (robot-initiated vs. self-recommended products) and reported no significant difference in perceived cuteness [52].

Another topic concerns relationships between robots. Shiomi et al. showed that two robots displaying an affiliative relationship via their motions increased the feeling of *kawaii* compared with a single robot or a non-affiliated pair [53]. Other studies investigated relationship-related factors via speech, as inter-robot conversation often signifies their relationship. Shi et al. found no main effect of vocal style in solitary baby-shaped robots; however, in multi-robot settings, inter-robot crying significantly reduced perceived cuteness [54]. Kimura et al. demonstrated that balanced speech distribution between two robots increased the perceived cuteness of the recommended product more than a single-robot recommendation [55].

## 4 Discussion

### *4.1 Implications for future work*

This review confirms that appearance (static visual modality), especially baby-schema features, remains the most common factor in engineering robot cuteness. The evidence further shows that responses vary by age, gender, and culture; such patterns are reported not only for robots [55] but also for other stimuli [56]. Because altering a commercial robot's industrial design is costly, future platforms should support post-manufacture customization, such as clothing and accessories, that enable owners to match visual qualities to their personal sense of cuteness. In fact, many pet-type robot owners already dress their robots, and analyzing these communities constitutes a promising HRI

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research topic [57].

A second research topic is motion, which is also related to dynamic visual modality. This factor can complement appearance-based cuteness. Simple gestures (e.g., gaze shifts, head tilts) are easy to implement on many platforms. One aspect of future work on motion generation is to learn cute motions from human demonstrators, as preliminary research has shown [58, 59]. By contrast, implementing these human-like gestures on highly human-like androids [60, 61] requires caution because uncanny-valley effects may arise, and moderately human-like robots are often rated cuter [30, 62].

Research topics related to non-visual channels, such as speech and inter-robot relationships, remain relatively less focused in HRI. Regarding the speech topic, cuteness related to sound characteristics has been broadly investigated in voice-agent design [63, 64]; such knowledge can be easily applied to the context of social robots, although it is necessary to consider factors such as the degree of consistency between appearance and voice. Regarding the topic of relationships, its expression requires the use of multiple robots and is recognized by others through motions and speeches, making it essential to combine it with other factors. Recent studies have reported the effectiveness of using multiple robots in various contexts [28, 65, 66]; therefore, cute designs based on expressing relationships between robots will be used primarily for commercial purposes to develop more acceptable robots by customers.

Although this survey is focused on the modalities related to perceived cuteness, some of the included studies investigated the relationships between perceived cuteness and trust [36, 37, 39]. These studies reported the possible risk (e.g., enhancing purchase intention for cute products [37] or perceived trust [39]), which might be related to the concept of “dark patterns.” In fact, prior work shows that endearing design can lower

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vigilance and steer user behavior [20]. Independent of cuteness, several studies report that robots strongly influence human behavior and decision-making [67–69]; increasing robot numbers amplifies this effect [70, 71]. Malicious actors could exploit these mechanisms through targeted design combinations (e.g., multiple deliberately cute-designed robots). Thus, technical advances must be accompanied by user literacy programs and ethical guidelines against anti-social interactions (i.e., anti-social-interaction literacy).

Finally, measuring cuteness across cultures remains challenging. As summarized in Table 1, some studies focused on cultural differences in the context of perceived cuteness, relying on a single-item cuteness-related question. The majority of the included studies were conducted in East Asia (e.g., Japan and China). However, several studies document cultural differences in perceived cuteness [56, 72–74]; incorporating such knowledge and covering diverse cultural differences are essential for culturally robust robot design. Adopting validated cuteness scales [75] and multimodal metrics (e.g., emotional, behavioral, physiological, or neural) [9, 76] would yield a more comprehensive evaluation framework.

### *4.2 Limitations of evidence and review process*

This study has several limitations. First, although the review spans up to 2024, numerous papers published in 2025 will need to be incorporated in future updates. Second, screening and coding were conducted by a single author, whereas best practice recommends multiple independent reviewers. Third, some Japanese studies may have translated *kawaii* as “cute,” potentially affecting keyword matching and inclusion.

## 5. Conclusion

This study surveyed recent research on cuteness design in HRI. Because cute design enhances social acceptance, a systematic investigation on how to make robots cuter benefits both researchers and designers. The PRISMA-guided rapid review shows that researchers primarily manipulate appearance, movement, speech, and relational factors to increase robot cuteness. Future work should combine these factors and establish culturally sensitive measurement tools to develop more appealing, socially acceptable social robots.

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## Disclosure Statement

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## Data Availability

All data and materials can be accessed by contacting the first author.

## References

[1] T. Shibata, "An overview of human interactive robots for psychological enrichment," *Proceedings of the IEEE,* vol. 92, no. 11, pp. 1749-1758, 2004.
[2] M. Fujita, "AIBO: Toward the era of digital creatures," *The International Journal of Robotics Research,* vol. 20, no. 10, pp. 781-794, 2001.
[3] N. Yoshida, S. Yonemura, M. Emoto, K. Kawai, N. Numaguchi, H. Nakazato, S. Otsubo, M. Takada, and K. Hayashi, "Production of character animation in a home robot: A case study of lovot," *International Journal of Social Robotics,* vol. 14, no. 1, pp. 39-54, 2022.
[4] S. Sotnik, and V. Lyashenko, "Prospects for Introduction of Robotics in Service," *International Journal of Academic Engineering Research (IAAER),* vol. 6, no. 5, pp. 4-9, 2022.
[5] K. Lorenz, "The innate forms of potential experience," *Z Tierpsychol,* vol. 5, pp. 235-409, 1943.

[6] V. Brooks, and J. Hochberg, “A psychophysical study of" cuteness.",” *Perceptual and Motor Skills,* vol. 11, no. 2, pp. 205, 1960.

[7] J. G. Myrick, “Emotion regulation, procrastination, and watching cat videos online: Who watches Internet cats, why, and to what effect?,” *Computers in human behavior,* vol. 52, pp. 168-176, 2015.

[8] A. M. Proverbio, V. D. Gabriele, M. Manfredi, and R. Adorni, “No race effect (ORE) in the automatic orienting toward baby faces: When ethnic group does not matter,” *Psychology,* vol. 2, no. 09, pp. 931-935, 2011.

[9] H. Nittono, and N. Ihara, “Psychophysiological responses to kawaii pictures with or without baby schema,” *SAGE Open,* vol. 7, no. 2, pp. 1-11, 2017.

[10] K. Nishiyama, K. Oishi, and A. Saito, “Passersby Attracted by Infants and Mothers' Acceptance of Their Approaches: A Proximate Factor for Human Cooperative Breeding,” *Evolutionary Psychology,* vol. 13, no. 2, pp. 147470491501300210, 2015.

[11] H. Nittono, M. Fukushima, A. Yano, and H. Moriya, “The power of kawaii: Viewing cute images promotes a careful behavior and narrows attentional focus,” *PloS one,* vol. 7, no. 9, pp. e46362, 2012.

[12] C. Stockman, and E. Nottingham, "Dark Patterns of Cuteness: Popular Learning App Design as a Risk to Children’s Autonomy," *Children, Young People and Online Harms: Conceptualisations, Experiences and Responses*, E. Setty, F. Gordon and E. Nottingham, eds., pp. 113-137, Cham: Springer International Publishing, 2024.

[13] A. Yim, S. X. He, A. P. Cui, and L. Zhao, “Carefree cuteness: the effect of exposure to cuteness on risk seeking,” *European Journal of Marketing,* vol. 59, no. 3, pp. 714-742, 2025.

[14] S. Kinsella, "Cuties in japan," *Women, media and consumption in Japan*, pp. 230-264: Routledge, 2013.

[15] H. Nittono, “The two-layer model of'kawaii': A behavioural science framework for understanding kawaii and cuteness,” *East Asian Journal of Popular Culture,* vol. 2, no. 1, pp. 79-96, 2016.

[16] W.-F. Hsieh, E. Sato-Shimokawara, and T. Yamaguchi, “Investigation of Robot Expression Style in Human-Robot Interaction,” *Journal of Robotics and Mechatronics,* vol. 32, no. 1, pp. 224-235, 2020.

[17] L. Chen, B. Ma, and X. Lu, “Research on the Influence of Cuteness Design of Service Robot on Hotel Customer Tolerance,” in 2022 International Conference on Computer Science, Information Engineering and Digital Economy (CSIEDE 2022), pp. 339-346, 2022.

[18] L. Guo, J. Liang, Y. Huang, and J. Shang, “The impact of the cuteness of service robots on consumers’ interaction willingness,” *Current Psychology,* vol. 43, no. 14, pp. 12402-12411, 2024.

[19] M. Ohkura, "Kawaii engineering," *Kawaii Engineering*, pp. 3-12: Springer, 2019.

[20] C. Lacey, and C. Caudwell, “Cuteness as a 'dark pattern' in home robots,” in Proceedings of the 14th ACM/IEEE International Conference on Human-Robot Interaction, Daegu, Republic of Korea, pp. 374–381, 2020.

[21] M. J. Page, J. E. McKenzie, P. M. Bossuyt, I. Boutron, T. C. Hoffmann, C. D. Mulrow, L. Shamseer, J. M. Tetzlaff, E. A. Akl, S. E. Brennan, R. Chou, J. Glanville, J. M. Grimshaw, A. Hróbjartsson, M. M. Lalu, T. Li, E. W. Loder, E. Mayo-Wilson, S. McDonald, L. A. McGuinness, L. A. Stewart, J. Thomas, A. C. Tricco, V. A. Welch, P. Whiting, and D. Moher, “The PRISMA 2020

statement: an updated guideline for reporting systematic reviews," *BMJ,* vol. 372, pp. n71, 2021.

[22] B. J. Zhang, K. Peterson, C. A. Sanchez, and N. T. Fitter, "Exploring Consequential Robot Sound: Should We Make Robots Quiet and Kawaii-et?," in 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 3056-3062, 2021.

[23] D. Berque, H. Chiba, M. Ohkura, M. Sugaya, P. Sripian, T. Laohakangvalvit, N. Noda, O. Cornejo, H. Dao, K. Eguchi, N. Jadram, R. Kei, T. Kobayashi, S. Nsangou, N. Sahchez, R. Uchiyama, and S. Yoshida, "Persona-Based and Scenario-Based Design of Virtual and Physical Companion Robots with Varied Kawaii (Cute) Attributes," in Human-Computer Interaction, Cham, pp. 58-74, 2024.

[24] R. A. Søraa, P. S. Nyvoll, K. B. Grønvik, and J. A. Serrano, "Children's perceptions of social robots: a study of the robots Pepper, AV1 and Tessa at Norwegian research fairs," *AI & SOCIETY,* vol. 36, no. 1, pp. 205-216, 2021.

[25] T. Ozeki, T. Mouri, H. Sugiura, Y. Yano, and K. Miyosawa, "Use of communication robots to converse with people suffering from schizophrenia," *ROBOMECH Journal,* vol. 7, no. 1, pp. 13, 2020.

[26] K. Kochigami, K. Okada, and M. Inaba, "Does an Introduction of a Person in a Group by a Robot Have a Positive Effect on People's Communication?," in 2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), pp. 692-698, 2018.

[27] C. Lefebvre, J. Glanville, S. Briscoe, A. Littlewood, C. Marshall, M.-I. Metzendorf, A. Noel-Storr, T. Rader, F. Shokraneh, J. Thomas, and L. S. Wieland, "Searching for and selecting studies," *Cochrane Handbook for Systematic Reviews of Interventions*, pp. 67-107, 2019.

[28] M. Shiomi, "A systematic survey of multiple social robots as a passive- and interactive-social medium," *Advanced Robotics,* vol. 38, no. 7, pp. 1-15, 2023.

[29] E. Liberman-Pincu, and T. Oron-Gilad, "Impacting the Perception of Socially Assistive Robots- Evaluating the effect of Visual Qualities among Children," in 2021 30th IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), pp. 612-618, 2021.

[30] Q. R. M. Hover, E. Velner, T. Beelen, M. Boon, and K. P. Truong, "Uncanny, Sexy, and Threatening Robots: The Online Community's Attitude to and Perceptions of Robots Varying in Humanlikeness and Gender," in Proceedings of the 2021 ACM/IEEE International Conference on Human-Robot Interaction, Boulder, CO, USA, pp. 119–128, 2021.

[31] N. Qie, P.-L. P. Rau, M. Ohkura, and C.-W. Tung, "Kawaii Perception of Artifacts Between Chinese and Japanese Cultures," *Kawaii Engineering: Measurements, Evaluations, and Applications of Attractiveness*, M. Ohkura, ed., pp. 225-239, Singapore: Springer Singapore, 2019.

[32] D. Berque, H. Chiba, T. Laohakangvalvit, M. Ohkura, P. Sripian, M. Sugaya, L. Guinee, S. Imura, N. Jadram, R. Martinez, S. F. Ng, H. Schwipps, S. Ohtsuka, and G. Todd, "Cross-Cultural Design and Evaluation of Student Companion Robots with Varied Kawaii (Cute) Attributes," in Human-Computer Interaction. Theoretical Approaches and Design Methods, Cham, pp. 391-409, 2022.

[33] K. Nonomura, K. Terada, A. Ito, and S. Yamada, "Effects of interaction and appearance on subjective impression of robots," in Robot and Human Interactive Communication (RO-MAN), 2015 24th IEEE International Symposium on, pp. 95-100, 2015.

[34] Y. Ishihara, and K. Kobayashi, “Projection mapping of behavioral expressions onto manufactured figures for speech interaction,” in 2017 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), pp. 12-16, 2017.

[35] T. Laohakangvalvit, P. Sripian, M. Sugaya, M. Ohkura, D. Berque, and H. Chiba, “Cross-Cultural Affective Evaluation of Kawaii Robots in Virtual Spaces,” in Culture and Computing, Cham, pp. 524-535, 2023.

[36] C.-H. Chen, and X. Jia, “Research on the influence of the baby schema effect on the cuteness and trustworthiness of social robot faces,” *International Journal of Advanced Robotic Systems,* vol. 20, no. 3, pp. 17298806231168486, 2023.

[37] X. Yu, Z. Xu, Y. Song, and X. Liu, “The cuter, the better? The impact of cuteness on intention to purchase AI voice assistants: A moderated serial-mediation model,” *Frontiers in Psychology,* vol. Volume 13 - 2022, 2022.

[38] A. D. Beir, and B. Vanderboght, “Evolutionary Method for Robot Morphology: Case Study of Social Robot Probo,” in The Eleventh ACM/IEEE International Conference on Human Robot Interaction, Christchurch, New Zealand, pp. 609–610, 2016.

[39] Y. Song, A. Luximon, and Y. Luximon, “The effect of facial features on facial anthropomorphic trustworthiness in social robots,” *Applied Ergonomics,* vol. 94, pp. 103420, 2021.

[40] M. Mara, and M. Appel, “Effects of lateral head tilt on user perceptions of humanoid and android robots,” *Computers in Human Behavior,* vol. 44, pp. 326-334, 2015.

[41] M. Shiomi, Y. Kato, H. Nittono, E. Anzai, and N. Saiwaki, “The Feeling of Kawaii toward a Robot's Head-Tilting Motion: Effects of Speed, Direction, and Accompanying Hand Gestures,” in 2024 33rd IEEE International Conference on Robot and Human Interactive Communication (ROMAN), pp. 69-74, 2024.

[42] M. Matsumoto, “Rebellious robot: On positive effects of negative behavior,” in Proceedings of the 2018 2nd International Conference on Mechatronics Systems and Control Engineering, Amsterdam, Netherlands, pp. 72–76, 2018.

[43] S. Sugano, Y. Miyaji, and K. Tomiyama, “Study of Kawaii-ness in Motion – Physical Properties of Kawaii Motion of Roomba,” in Human-Computer Interaction. Human-Centred Design Approaches, Methods, Tools, and Environments, Berlin, Heidelberg, pp. 620-629, 2013.

[44] M. Cooney, S. Nishio, and H. Ishiguro, “Affectionate interaction with a small humanoid robot capable of recognizing social touch behavior,” *ACM Transactions on Interactive Intelligent Systems (TiiS),* vol. 4, no. 4, pp. 1-32, 2014.

[45] J. Ichino, and D. Takahashi, “How Different Blink Patterns of Pet Robots Evoke Feelings of Affection in People,” in Computer-Human Interaction Research and Applications, Cham, pp. 39-52, 2024.

[46] N. Randall, and S. Sabanovic, “A Picture Might Be Worth a Thousand Words, But It's Not Always Enough to Evaluate Robots,” in Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction, Stockholm, Sweden, pp. 437–445, 2023.

[47] M. Okuda, Y. Takahashi, and S. Tsuichihara, “Effect of Humanoid Robot's Reaction on Human Touch to Robot,” in 2020 Joint 11th International Conference on Soft Computing and Intelligent Systems and 21st International Symposium on Advanced Intelligent Systems (SCIS-ISIS), pp. 1-6, 2020.

[48] Y. Okada, M. Kimoto, T. Iio, K. Shimohara, H. Nittono, and M. Shiomi, "Kawaii emotions in presentations: Viewing a physical touch affects perception of affiliative feelings of others toward an object," *Plos one,* vol. 17, no. 3, pp. e0264736, 2022.

[49] N. Matsunaga, and M. Shiomi, "Does a wearing change perception toward a robot?," in 2021 30th IEEE International Conference on Robot & Human Interactive Communication (RO-MAN), pp. 963-968, 2021.

[50] T. Ozeki, T. Mouri, and H. Fukui, "Investigation of the Development of Robots for Training Dialect Communication Listening in Nursing Care Situations: A Case Study of Mikawa Dialects," *Journal of Robotics and Mechatronics,* vol. 35, no. 3, pp. 844-858, 2023.

[51] H. Kasuga, D. Sakamoto, N. Munekata, and T. Ono, "A Social Robot in a Human-Animal Relationship at Home: A Field Study," in Proceedings of the 5th International Conference on Human Agent Interaction, Bielefeld, Germany, pp. 61–69, 2017.

[52] T. Iwamoto, J. Baba, K. Nishi, T. Unokuchi, D. Endo, J. Nakanishi, Y. Yoshikawa, and H. Ishiguro, "The Effectiveness of Self-Recommending Agents in Advancing Purchase Behavior Steps in Retail Marketing," in Proceedings of the 9th International Conference on Human-Agent Interaction, Virtual Event, Japan, pp. 209–217, 2021.

[53] M. Shiomi, R. Hayashi, and H. Nittono, "Is two cuter than one? number and relationship effects on the feeling of kawaii toward social robots," *PLOS ONE,* vol. 18, no. 10, pp. e0290433, 2023.

[54] S. Feng, N. Yamato, H. Ishiguro, M. Shiomi, and H. Sumioka, "Effect of Emotional Expression on the Impression of Older People Towards Baby-like Robots: Effect of Emotional Expression of Baby-like Robots on Older People," in Proceedings of the 12th International Conference on Human-Agent Interaction, Swansea, United Kingdom, pp. 414–416, 2024.

[55] Y. Kimura, E. Anzai, N. Saiwaki, and M. Shiomi, "Two is better than one: descriptions by multiple robots strengthen the feeling of kawaii toward objects," in 2024 33rd IEEE International Conference on Robot and Human Interactive Communication (ROMAN), pp. 485-490, 2024.

[56] H. Nittono, S. Lieber-Milo, and J. P. Dale, "Cross-Cultural Comparisons of the Cute and Related Concepts in Japan, the United States, and Israel," *SAGE Open,* vol. 11, no. 1, pp. 1-16, 2021.

[57] Z. Ye, W.-C. Chen, and S. Sabanovic, "Dressing up AIBO: An Exploration of User-generated Content of Robot Clothing on Twitter," in Proceedings of the 11th International Conference on Human-Agent Interaction, pp. 81-89, 2023.

[58] M. Suguitan, and G. Hoffman, "What is it like to be a bot? Variable perspective embodied telepresence for crowdsourcing robot movements," *Personal and Ubiquitous Computing,* vol. 27, no. 2, pp. 299-315, 2023.

[59] M. Sakashita, T. Minagawa, A. Koike, I. Suzuki, K. Kawahara, and Y. Ochiai, "You as a Puppet: Evaluation of Telepresence User Interface for Puppetry," in Proceedings of the 30th Annual ACM Symposium on User Interface Software and Technology, Québec City, QC, Canada, pp. 217–228, 2017.

[60] D. F. Glas, T. Minato, C. T. Ishi, T. Kawahara, and H. Ishiguro, "Erica: The erato intelligent conversational android," in Robot and Human Interactive Communication (RO-MAN), 2016 25th IEEE International Symposium on, New York, NY, United States, pp. 22-29, 2016.

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[61] M. Shiomi, H. Sumioka, K. Sakai, T. Funayama, and T. Minato, “SŌTO: An android platform with a masculine appearance for social touch interaction,” in Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction, pp. 447-449, 2020.
[62] M. Mori, “The uncanny valley,” *Energy,* vol. 7, no. 4, pp. 33-35, 1970.
[63] K. Seaborn, S. Nam, J. Keckeis, and T. Itagaki, “Can voice assistants sound cute? Towards a model of kawaii vocalics,” in Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems, pp. 1-7, 2023.
[64] Y. Mandai, K. Seaborn, T. Nakano, X. Sun, Y. Wang, and J. Kato, “Super Kawaii Vocalics: Amplifying the "Cute" Factor in Computer Voice,” in Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems, pp. Article 999, 2025.
[65] S. Sebo, B. Stoll, B. Scassellati, and M. F. Jung, “Robots in Groups and Teams: A Literature Review,” *Proc. ACM Hum.-Comput. Interact.,* vol. 4, no. CSCW2, pp. Article 176, 2020.
[66] A. Dahiya, A. M. Aroyo, K. Dautenhahn, and S. L. Smith, “A survey of multi-agent Human–Robot Interaction systems,” *Robotics and Autonomous Systems,* vol. 161, pp. 104335, 2023.
[67] S. Booth, J. Tompkin, H. Pfister, J. Waldo, K. Gajos, and R. Nagpal, “Piggybacking Robots: Human-Robot Overtrust in University Dormitory Security,” in Proceedings of the 2017 ACM/IEEE International Conference on Human-Robot Interaction, Vienna, Austria, pp. 426–434, 2017.
[68] A. M. Aroyo, T. Kyohei, T. Koyama, H. Takahashi, F. Rea, A. Sciutti, Y. Yoshikawa, H. Ishiguro, and G. Sandini, “Will People Morally Crack Under the Authority of a Famous Wicked Robot?,” in 2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), pp. 35-42, 2018.
[69] Y. Kimura, E. Anzai, N. Saiwaki, and M. Shiomi, “Fool Me Twice, Shame on Me: Being Deceived by a Robot Does Not Make People More Cautious,” in 2025 34th IEEE International Conference on Robot and Human Interactive Communication (ROMAN), pp. accepted, 2025.
[70] A.-L. Vollmer, R. Read, D. Trippas, and T. Belpaeme, “Children conform, adults resist: A robot group induced peer pressure on normative social conformity,” *Science Robotics,* vol. 3, no. 21, pp. eaat7111, 2018.
[71] M. Shiomi, and N. Hagita, “Do the number of robots and the participant’s gender influence conformity effect from multiple robots?,” *Advanced Robotics,* vol. 33, no. 15-16, pp. 756-763, 2019.
[72] S. Lieber-Milo, and H. Nittono, “How the Japanese Term Kawaii Is Perceived Outside of Japan: A Study in Israel,” *SAGE Open,* vol. 9, no. 3, pp. 2158244019869904, 2019.
[73] H. Nittono, H. Saito, N. Ihara, D. Fenocchio, and J. M. Andreau, "English and Spanish adjectives that describe the Japanese concept of kawaii," Advance, 2021.
[74] H. Nittono, H. Saito, N. Ihara, D. N. Fenocchio, and J. M. Andreau, “English and Spanish adjectives that describe the Japanese concept of kawaii,” *SAGE Open*, pp. 1-12, 2023.
[75] R. Takamatsu, “Measuring Affective Responses to Cuteness and Japanese kawaii as a Multidimensional Construct,” *Current Psychology,* vol. 39, no. 4, pp. 1362-1374, 2020.

[76] J. J. Endendijk, A. K. Smit, A. L. van Baar, and P. A. Bos, "What a cute baby! Preliminary evidence from a fMRI study for the association between mothers' neural responses to infant faces and activation of the parental care system," *Neuropsychologia,* vol. 143, pp. 107493, 2020.