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Risk Perception and Risk Behavior in Response to Service Robot Anthropomorphism in Banking

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Abstract

Purpose: This article explores how anthropomorphized service robots shape consumer risk perceptions and risk behavior via uncanniness as a function of individual differences in banking.

Methodology: An online between-subjects experiment (N = 293), set in a fictitious bank, featuring four levels of service robot anthropomorphism (low, medium, high, human), measured risk perceptions (psychological, functional, privacy, time), and risk behavior as DVs, uncanniness as mediator, technology readiness, and behavioral inhibition as moderators.

Findings: Risk perceptions are the lowest for medium (vs. high) anthropomorphism and are mediated by uncanniness. Risk behavior remains unaffected by the manipulation. Technology readiness overall attenuates the main effect on time risk perception but amplifies it for high anthropomorphism, whereas high behavioral inhibition increases risk behavior under the exposure of low anthropomorphism.

Implication: Banks who plan to place robots in service functions should be mostly concerned about experiential rather than behavioral consequences and are advised to use medium anthropomorphism robots since they appear to qualify as viable substitutes for human bank tellers.

Value: We contribute to the service robot and anthropomorphism literature by (1) distinguishing between dimensions of risk perceptions, (2) measuring actual risk behavior, and (3) setting our study in a business and marketing relevant context: banking.

Keywords: anthropomorphism, risk perception, risk behavior, service robots, uncanny valley.

JEL: M30, M31

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Introduction

Services in many industries such as tourism, healthcare, and banking are increasingly being automatized with the purpose of reducing costs and increasing service efficiency. Emerging health safety concerns during the Covid-19 pandemic have further accelerated those automatization processes, and it is likely that in the future, more and more services will be fully or partially provided by machines.

In the wake of those developments, research questions addressing consumer reactions toward robots have received greater attention (Blut, Wang, Wünderlich, and Brock, 2021), especially in service contexts involving social interactions with anthropomorphized agents. Anthropomorphism describes "the level of an object's humanlike characteristics" (Gursoy et al., 2019, p. 160) and refers to "perceiving human-like traits in nonhuman agents" (Epley, 2018, p. 591). When robots are anthropomorphized, consumers tend to assess the pertaining anthropomorphized agent more favorably.

However, negative attitudes emerge as robots become increasingly human-like, which makes them seem uncanny (Mori, 1970). Uncanniness, as a negative affect, has been found to lead to negative outcomes in consumer behavior, such as less liking of anthropomorphized robots (Kim, Schmitt, and Thalmann, 2019), but there is little evidence on how anthropomorphism and uncanniness affect risk perceptions (e.g. Kim and McGill, 2011) and, in particular, risk behavior. Previous research has detailed how risk perceptions and affect are related, showing that "instinctive and intuitive reactions to danger" function as an affect heuristic (risk as feeling) that allows one to infer whether an instance should be perceived as risky or not (Slovic and Peters, 2006, p. 322). Positive affect consequently leads to low perceived risk, negative affect to high perceived risk. Moreover, risk perception and subsequent risk behavior are correlated. Depending on whether available risk information is quantitative or gist-based, this correlation may be positive or negative. We suggest that uncanniness as a negative affect provides gist-based risk information about the robot, so that as uncanniness increases, it also increases risk perception and, in turn, reduces risk behavior (Mills, Reyna, and Estrada, 2008), thus functioning as a mediator in this relationship.

Moreover, the effect of robot anthropomorphism appears to be a function of consumer characteristics, namely individual differences (Blut et al., 2021). We argue that the effect depends on individual differences related to new technologies and innovative products, like technology readiness (Parasuraman and Colby, 2014), as well as to coping styles in the face of uncertainty and risk, like behavioral inhibition (Carver and White, 1994), which will modulate the effect of anthropomorphized service robots on risk perception as well as risk behavior.

The understanding of those processes, interactions, and effects will provide insights into how anthropomorphism affects people and how exposure to those robots changes their behavior. This allows businesses and marketers to design an optimal consumer experience while simultaneously mitigating pitfalls associated with the uncanny valley phenomenon. To our knowledge, this would represent a first such insight while distinguishing between dimensions of risk perceptions, measuring actual risk behavior, and applying it to a particular business and marketing relevant context – that of banking.

Consequently, set in the context of a fictitious bank service encounter, this article will examine the relationship between different levels of robot anthropomorphism (low, medium, high, human) on risk perceptions and risk behavior via uncanniness for consumers with different levels of technology readiness and behavioral inhibition. Below, we will review the academic literature, highlight theoretical underpinnings, lay out our study methodology, and present results of a between-subjects online experiment featuring four levels of robot anthropomorphism.

Literature Review

Anthropomorphism

Anthropomorphism is derived from the two Greek root words *ánthrōpos* ("human") and *morphē* ("form"), which refers to the resemblance of a non-human object with the human form. However, anthropomorphism does not merely describe an objective degree of human-likeness or resemblance to the human form of a certain object, but it also describes an individual's subjective experience of the object by means of perception. Consequently, anthropomorphism both means "perceiving human-like traits in nonhuman agents" (Epley, 2018, p. 591) and "refers to the level of an object's humanlike characteristics" (Gursoy et al., 2019, p. 160).

Beyond the subjective tendency to anthropomorphize objects, which depends on individual factors such as need for social connection (Epley, Waytz, and Cacioppo, 2007), anthropomorphism can be actively evoked by imbuing a nonhuman tangible or intangible object with features that establish a greater congruity with human schema representations in the mind of the consumer (MacInnes and Folkes, 2017). Such intentional changes can be used e.g. to render products more human-like and create more favorable product evaluations (Aggarwal and McGill, 2007) as well as shape consumer preferences of brands (Wan and Aggarwal, 2015). Moreover, anthropomorphism may elicit perceptions of mind (Puzakova and Kwak, 2017) and personality (Landwehr, McGill, and Herrmann, 2011) in brands, thus rendering them more relatable (for a literature review on humanizing brands, see MacInnes and Folkes, 2017).

Comparable positive consequences were identified in connection with robots. Previous research exploring robot anthropomorphism suggests that anthropomorphism has a positive effect on increasing adoption intentions of AI robot assistance (Tussyadiah and Park, 2018), and is a determinant of AI use and user behavior (Lu, Cai, and Gursoy, 2019; Van Doorn et al., 2017).

Essential for robot anthropomorphism are two mechanisms by which non-human agents can be anthropomorphized: form and mind. Form refers to the physical appearance of the robot and the extent to which that appearance is congruent with human schema representations, thus the "human" category (Mathur et al., 2020). Mind refers to attributing experience and agency to an agent based on relevant salient cues, such as a robot with human-like features (Gray, Gray, and Wegner, 2007; Müller, Gao, Nijssen, and Damen, 2020). Perceiving form and mind consequently allows individuals to feel greater emotional attachment toward robots (Kiesler and Goetz, 2002), promotes attributions of warmth (Kim et al., 2019), and fosters self-connections between consumers and the anthropomorphized objects (McInnis and Folkes, 2017). Thus, form and mind ascribed to non-human agents can render them more appealing and relatable in the eye of the observing consumer. Furthermore, designing more human-like robots lowers the threshold that consumers need to overcome to want to use AI assistance, qualifying robot anthropomorphism as a valid segue to better service experiences.

The Dark Side of Anthropomorphism: The Uncanny Valley

However, consumer reactions toward robots overall tend to be rather ambiguous than distinct. Further increasing human-likeness – e.g. by introducing discernible human features like age or gender – may lead to negative emotions and attributions (Kim et al., 2019; Mori, 1970). This effect was called the uncanny valley phenomenon (Mori, 1970), which suggests that anthropomorphism does not lead linearly to more favorable assessments as robots become more human-like. Instead, people's affinity to increasingly anthropomorphized robots steeply declines at a certain point, at which it plummets into the uncanny valley; prior research suggests it happens at 70% human-likeness (Weis and Wiese, 2017). Only approaching perfect human-likeness reverses this negative effect (Mori, 1970). Unsurprisingly, consumers tend to demonstrate more favorable

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reactions to robots that range lower in anthropomorphism (Goudey and Bonnin, 2016). Lower levels of anthropomorphism could thus be more suitable for circumnavigating undesirable side effects associated with high anthropomorphism such as perceived threats to human distinctiveness and self-identity (Rosenthal-von der Pütten and Krämer, 2014; Ackerman, 2016; Gursoy, 2019; Müller et al., 2020) as well as uncanniness.

Previous research indicates several reasons for the emergence of uncanniness in response to anthropomorphism in robots. Mori (1970) originally suggested that death associations led people to react with negative affect toward anthropomorphized agents, as confirmed in more recent work (Kochate et al., 2016). However, other theories appear more prevalent and enjoy greater support, namely the categorization conflict (Weis and Wiese, 2017; Mathur and Reichling, 2016) and mind perception (e.g. Gray and Wegner, 2012).

Even though the above theories describe distinct mechanisms, they agree on one point: the relationship between anthropomorphism and uncanniness is non-linear, and it is the slightly anthropomorphized robot (humanoid) that seems to fare best.

Risk Perception and Risk Behavior

Besides its relationship with the emergence of uncanniness, anthropomorphism is highlighted as a key construct for studying consumer perceptions (Schmitt, 2019). Consumer perceptions, such as risk perceptions, can affect consumer intentions, choices, and subsequent behaviors (Sheeran, Harris, and Epton, 2014). Kim and McGill (2011, p. 94) propose that "risk perceptions are systematically influenced by anthropomorphism," thus robot anthropomorphism should influence risk perceptions and subsequent behavioral responses. Risk perceptions represent the feeling of uncertainty when it is likely that unanticipated and unwanted consequences emerge in response to consumer actions (Dholakia, 2001). Risk perceptions can be differentiated based on the domain in which the consequences materialize. For example, psychological risk relates to anxiety and discomfort while using a product or service, functional risk is experienced under expectations of potential underperformance of a product or service provider (Dholakia, 2001), while time and privacy risks pertain to the potential loss of time and security of private information (Malhotra, Kim and Agarwal, 2004).

Slovic and Peters (2006) argue that risk perceptions and risk behaviors follow two fundamental principles: risk as feeling and risk as analysis. The latter represents a rational assessment of risk and benefits, the former a more intuitive approach to the same end. Interestingly, risk as feeling appears to immediately shape judgments of risk, functioning as an affect heuristic, with positive affect leading to low-risk perception and negative affect to high-risk perception (Finucane et al., 2000; Alhakami and Slovic, 1994). However, whether risk perceptions give rise to a lesser (protective function) or greater tendency to engage in risk behavior (reflective function) depends on the nature of available risk information (Mills et al., 2008). The underlying fuzzy-trace theory suggests that increased risk behavior should result from quantitative information (e.g. discrete probabilities), while decreased risk behavior should stem from gist-based processing of relevant contextual information (e.g. salient object features; Reyna and Farley, 2006; Mills et al., 2008) representing "two divergent paths to risk-taking: a reasoned and a reactive route" (Reyna and Farley, 2006, p. 1).

Consequently, we expected to find greater risk perceptions and lower risk-taking when uncanniness is more pronounced, meaning that the negative affect of uncanniness functions as an affect heuristic for risk perception, and gist-based spontaneous processing of anthropomorphism should reduce risk behavior. Thus, increasing robot anthropomorphism will at first reduce risk perceptions. However, as human-likeness further rises, uncanniness will begin to negatively affect consumer attitudes (Kim et al., 2019) and should – as a negative emotional assessment – amplify risk perceptions that will, in turn, reduce risk behavior (Slovic and Peters, 2006; Mills et al., 2008).

The Influence of Individual Differences

Individual differences play a focal role in robot anthropomorphism (Blut et al., 2021), especially those related to new technologies, innovative products, and coping styles in the face of uncertainty and risk, such as technology readiness (Parasuraman and Colby, 2014) and behavioral inhibition (Carver and White, 1994).

We supposed that technology readiness – describing the tendency of individuals to adopt and embrace technology (Parasuraman and Colby, 2014) – increases consumer openness to new technology, rendering them less uneasy when using such technologies. Technology-ready consumers would consequently be less affected by higher degrees of anthropomorphism, leading to decreased risk perceptions and increased risk behavior.

Behavioral inhibition (Carver and White, 1994) refers to the extent to which people are perceptive of risks and danger and engage in behavior to avoid those. Conversely, consumers ranging high in behavioral inhibition should exhibit more pronounced negative reactions toward high anthropomorphism as they tend to avoid ambiguous and unclear circumstances. Hence, high behavioral inhibition should lead to increased

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risk perceptions and decreased risk behavior. Thus, we expect a positive interaction effect of technology readiness and a negative interaction effect of behavioral inhibition.

Methodology

Participants and Design

An international sample of 293 participants (45.4% females; M_{age} = 26.2, SD_{age} = 8.5) participated in our preregistered online study (https://osf.io/hs8b2/), which we distributed via the Prolific online platform. The study used a one-factorial between-subjects design, with robot anthropomorphism as the between-subjects factor ("low" vs. "medium" vs. "high" vs. "human"), while using risk perception and risk behavior as dependent variables.

Manipulation of Robot Anthropomorphism

We manipulated robot anthropomorphism by exposing participants to the image of one of four possible service robots. For the low, medium, and high robot anthropomorphism, we used images of three existing robots that had previously been validated and used in research by Kim et al. (2019; see Table 1), depicting Ethon 2 (low anthropomorphism), Pepper (medium anthropomorphism), and Erica (high anthropomorphism). The fourth condition showed respondents a real human who was presented as a robot.

Table 1. Stimuli of the anthropomorphism manipulation conditions

Low (Ethon 2)	Medium (Pepper)	High (Erica)	Human
			

Note: Stimuli for low, medium, and high anthropomorphism have been obtained from Kim et al. (2019), who validated differences in human-likeness in a pretest (N = 202). The stimulus for the human manipulation condition has been purchased from iStock.

Source: own elaboration.

Measures

Manipulation Check

To check whether our manipulation of robot anthropomorphism had been successful, we presented participants with three items taken from Kim and McGill (2011); i.e. "It looks like a person," "It seems almost as if it has free will," "It seems almost as if it has intentions"; items were positioned on a seven-point scale, ranging from 1 = "disagree" to 7 "agree." We averaged the three items to create an anthropomorphism index (α = .794).

Perceived Risk

Furthermore, we measured to what extent participants found their interactions with the robots risky. We specifically gauged four types of risk perception vis-à-vis the robot: psychological risk (four items, after Dholakia, 2001; sample item: "I would worry a lot when using services from this bank"; α = .922), functional risk (three items, after Dholakia, 2001; sample item: "When using services from this bank, I would worry about how reliable they would be"; α = .868), privacy risk (four items, from Malhotra et al., 2004; sample item: "It would be risky to give my personal information to this bank"; α = .939), and time risk (two items, created by the authors, sample item: "It looks like it would take a lot of time to get serviced from this bank"; α = .864). Each item was scored on a seven-point scale, ranging from 1 = "disagree" to 7 = "agree".

Risk Behavior

In addition to measuring perceived risk, we also tested participants' actual risk behavior using an adapted version of Tversky and Kahneman's (1981) "Asian Disease" framing paradigm (Anderson and Galinsky, 2006). This adapted version is an investment task prompting respondents to indicate their preference for six investment choice pairs on a six-point scale from risk-averse (1 = "very much prefer Option A") to risk-seeking (6 = "very much prefer Option B"), choosing between either a safe (Option A, e.g. "100% chance of 2,5% return on investment") or a risky investment choice (Option B, e.g. "25% chance of 10% return on investment and 75 % chance of 0% return on investment."). We created an overall risk behavior measure by averaging the scores of all items.

Uncanniness

To verify whether the service robots differed in terms of uncanniness, we asked respondents to indicate to what extent they felt "uneasy," "unnerved," "creeped out," and "disturbed" by the robot as a service provider; we used a seven-point scale ranging from 1 = "not at all" to 7 = "very much." The first three items were taken from Gray and Wegner (2012), while we added the last item. We averaged those items to receive a score for uncanniness (α = .869).

Moderators

Finally, we tested whether the effect of robot anthropomorphism on risk perception/taking was a function of technology readiness (Parasuraman and Colby, 2014) and behavioral inhibition (BIS; Carver and White, 1994). We gauged participants' technology readiness with 10 items from Parasuraman and Colby (2014), the sample item being "I keep up with the latest technological developments in my areas of interest"; 1 = "strongly disagree" to 5 = "strongly agree"; $\alpha = .731$. Moreover, we tested behavioral inhibition with seven items from Carver and White (1994), the sample item being "I worry about making mistakes;" 1 = "very true for me" to 4 = "very false for me"; $\alpha = .747$.

Procedure

For this study, participants were randomly assigned to one of four anthropomorphism conditions. The cover story described a huge and innovative bank that wants to know more about consumer experience in service encounters and that is particularly interested in improving their assistance to clients regarding investment choices. Participants were asked to imagine making an investment choice in a service encounter with the depicted robot, detailing the procedure of handing over one's ID card, elaborating on one's intention to invest, and eventually, making an investment choice with the help of the robot. After the cover story and exposure to the respective service robots, respondents had to report feelings of uncanniness toward the presented stimulus, followed by measures for risk behavior, risk perceptions, and a manipulation check. The study concluded by measuring technology readiness, behavioral inhibition, and basic demographics.

Results

Analyzing the study data, we ran several one-way ANOVAs in SPSS with anthropomorphism as IV and both risk perception and risk behavior as DV (see Table 2). We found that seeing medium versus low or high anthropomorphism robots leads to decreased privacy risk perception. Looking at the contrast between medium- and high-level anthropomorphism, we noticed a significantly increased psychological, privacy, and time risk perception. For actual risk-taking behavior, we found no effect of our manipulation.

Table 2. Means, standard deviations, and one-way analyses of variance in the manipulation check, uncanniness and four dimensions of risk perception and risk behavior

Measure	Low		Medium		High		Human		*Contrast* (*p*)			*F* (3, 289)	η2
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Lo-Me*	*Me-Hi*	*Hi-Hu*		
Manipulation	1.90	1.18	2.63	1.27	2.68	1.25	4.97	1.27	.001	.772	<.001	84.536***	.47
Uncanniness	3.86	1.54	3.58	1.47	4.35	1.35	3.76	1.50	.262	.002	.016	3.654*	.04
Risk Perception													
Psychological	3.69	1.51	3.27	1.40	3.84	1.41	3.49	1.57	.089	.019	.148	2.065	.02
Functional	3.85	1.49	3.87	1.50	4.26	1.30	3.89	1.58	.948	.106	.123	1.328	.01
Privacy	3.66	1.58	3.10	1.47	3.88	1.40	3.64	1.62	.027	.002	.331	3.466*	.04
Time	2.93	1.63	2.98	1.59	3.57	1.60	3.01	1.57	.858	.027	.036	2.563	.03
Risk Behavior	2.53	1.09	2.44	.97	2.68	.93	2.54	1.02	.591	.161	.413	.673	.01

Note: Lo = low, Me = medium, Hi = high, Hu = human; ***$p < .001$., **$p < .01$, *$p < .05$.

Source: own elaboration.

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Mediation Analyses

Furthermore, we ran several multicategorical mediation analyses in PROCESS (Model 4), with anthropomorphism as IV, risk perception and risk behavior as DV, and uncanniness as the mediator. The results showed that uncanniness mediated the effect of anthropomorphism (medium vs. high) on psychological risk (b = .49, SE = .15 ,95% CI .20 to .81)[4], functional risk (b = .37, SE = .12, 95% CI .14 to .62), privacy risk (b = .34, SE = .12, 95% CI .12 to .60), and time risk (b = .24, SE = .09, 95% CI .04 to .44). Basically, these results suggested that higher anthropomorphism leads to more uncanniness, which in turn, increases risk perceptions. However, perfect human-likeness appears to reverse the effect. When comparing high anthropomorphism and the human manipulation condition, the effect on risk perceptions was again attenuated for all risk perception dimensions: psychological risk (b = -.37, SE = .15, 95% CI -.68 to -.08), functional risk (b = -.28, SE = .12, 95% CI -.52 to -.06), privacy risk (b = -.26, SE = .11, 95% CI -.50 to -.05), and time risk (b = -.18, SE = .08, 95% CI -.37 to -.04).

Moreover, contrasts between the human manipulation condition and medium anthropomorphism were not significant in all mediation analyses featuring risk perception as DV, showing no statistical differences on psychological risk (b = .05, SE = .08, 95% CI -.10 to .20), functional risk (b = .04, SE = .05, 95% CI -.06 to .15), privacy risk (b = .03, SE = .05, 95% CI -.05 to .13), and time risk (b = .03, SE = .04, 95% CI -.05 to .13). Evaluations of uncanniness did not differ between the human manipulation condition and medium anthropomorphism (p = .46).

Moderation Analyses

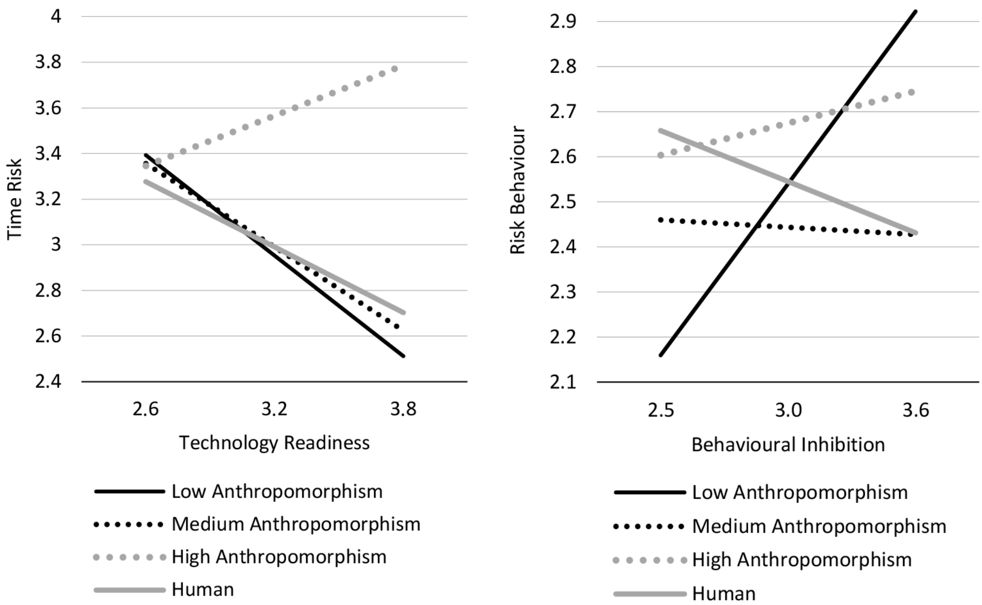
Furthermore, we performed multicategorical moderation analyses in PROCESS for SPSS (Model 1) with anthropomorphism as IV, both risk perception and risk behavior as DVs, and technology readiness and behavioral inhibition as moderators. Medium and high technology readiness (TRI_{low} = 2.57; TRI_{med} = 3.19; TRI_{high} = 3.81) diminished time risk perceptions for low and medium robot anthropomorphism (low vs. high: b = .53, SE = .23, t = 2.36, p =.020; medium vs. high: b = .95, SE = .44, t = 2.14, p =.033) as well as toward the human manipulation condition (high vs. human b = -.82, SE = .41, t = -2.00, p = .047) when comparing with high robot anthropomorphism in which case medium and high technology readiness reversed the direction of the effect increasing time risk perception. For low technology readiness the effect did not differ between

4 Indirect effects are reported from here on.

all anthropomorphism conditions ($M_{AM\ low}$ = 3.39; $M_{AM\ med}$ = 3.36; $M_{AM\ high}$ = 3.35; $M_{AM\ hum}$ = 3.23; F (3, 289) < 1, p = .99, see Figure 1).

Moderation by behavioral inhibitions indicated that "risk avoidant" high behavioral inhibition individuals (BIS_{low} = 2.49; BIS_{med} = 3.02; BIS_{high} = 3.55) seem to take more risks when exposed to low anthropomorphism service robots in comparison to medium anthropomorphism (b = -.75, SE = .29, t = -2.56, p = .011) and the human manipulation condition (b = -.31, SE = .11, t = -2.86, p = .005). In the latter case the effect flipped (low BIS:[5] b = .16, SE = .08, t = 2.04, p = .043; high BIS: b = -.16, SE = .08, t = -2.01, p = .046, see Figure 1).

Figure 1. Moderation of the effect of anthropomorphism on (left) time risk perception by technology readiness and on (right) risk behavior by behavioral inhibition



Source: own elaboration.

Finally, the manipulation check had been significant (p = .000), but when looking at the contrast between medium and high anthropomorphism, we found no significant difference (p = .772). This anomaly contradicts the results of Kim et al. (2019), in which medium and high anthropomorphism produced significant differences.

[5] We report here conditional effects of the predictor at low and high values of the moderator.

Discussion and Conclusion

Our findings provide evidence on how service robot anthropomorphism influences psychological, functional, privacy, and time risk perceptions via uncanniness, demonstrating a non-linear relationship between anthropomorphism and risk perception: consumer risk perceptions are the lowest in the human manipulation condition and for medium-level anthropomorphism, when robots are human-like but do not yet resemble an individual with discernible features (age, gender, appearance, etc.) as in the high anthropomorphism condition. The main effect of anthropomorphism on risk perception was significant for privacy, although not for psychological, functional, and time risk. Nevertheless, we found mediation via uncanniness for all four risk perception dimensions.

Concurrent with previous research (Kim et al., 2019; Kim & McGill, 2011), we found support for the emergence of uncanniness in response to anthropomorphized robots, suggesting that a too human-like design of service robots is undesirable (see, high anthropomorphism). Interestingly, uncanniness assessments are similar between medium anthropomorphism (Pepper) and the human manipulation condition. Similar patterns arise for mediation via uncanniness, overall indicating that medium anthropomorphism robots, such as Pepper, may constitute a viable substitute for human bank tellers.

Furthermore, we show that – contrary to our expectation – risk behavior is not affected by varying degrees of anthropomorphism. This might be due to the availability of conflicting risk information. On the one hand, uncanniness provides gist-based information, namely feeling unnerved (risk as feeling), on the other hand, the risk behavior task introduces quantitative information, meaning discrete probabilities and returns on investments (risk as analysis). The former is associated with decreased risk behavior, the latter with increased risk-taking (Reyna and Farley, 2006; Mills et al., 2008). The availability of both types of information may cancel the effect, which suggests that implementing anthropomorphized service robots in banks assisting investment choices would affect certain dimensions of consumer risk perception, albeit not risk behavior.

Only when testing for moderation by behavioral inhibition on the effect of anthropomorphism on risk behavior do "risk-avoidant" high-behavioral inhibition individuals seem to take more risks when exposed to low anthropomorphism (Ethon 2). This contradicts our expectation that more uncanny agents (low and particularly high anthropomorphism) that elicit greater risk perception would lead to reduced risk-taking.

Moreover, it remains unclear why low anthropomorphism and not high anthropomorphism drives this effect.

Furthermore, technology readiness reduces the effect of anthropomorphism on time risk perception for all manipulation conditions, except for the high anthropomorphism condition, in which case the effect is magnified. This might be because high technology readiness individuals are not merely more open and, perhaps, more appreciative toward novel technologies – which leads to reduced time risk perceptions – but also seem to be more susceptible to negative side effects, such as the uncanny valley, which leads to greater time risk perceptions toward uncanny agents.

Thus, we contribute to a better understanding of the impact of consumer characteristics in robot–human interactions regarding technology readiness and behavioral inhibition, pointing toward the relevance of technology readiness for risk perceptions and behavioral inhibition for risk behavior. Moreover, it appears that a too-human-like design of service robots is generally undesirable as it affects risk perception and thus may be detrimental to customer experience.

The banks who want to implement service robots are advised to use medium anthropomorphism robots, such as Pepper, since they evoke the least adverse consumer reactions, which are comparable to levels of risk perception toward human bank tellers, qualifying medium level robots as viable substitutes for human bank tellers. Moreover, risk behavior – as measured in investment tasks – seems unaffected by varying degrees of anthropomorphism, the only exception being low anthropomorphism. This suggests that, overall, banks should be mostly concerned about experiential – and less about behavioral –consequences when using service robots as bank tellers. Moreover, banks may pilot rollouts of service robots with consumers who range higher in technology readiness. Testing service robots with high-technology-ready individuals leverages the insight that technology readiness amplifies both the positive (more liking) and negative effects (less liking) of anthropomorphism. Thus, it appears to be the most effective way to test and tailor service robots to a real bank service setting.

Future studies should test the conjecture that the availability of conflicting risk information may lead to the absence of statistically significant differences among the conditions of anthropomorphism manipulations in eliciting risk behavior. This could be done by removing risk information (here: conditional and discrete probabilities) from the study design and using conceptual risk-taking tasks, such as the balloon analog risk-taking task (Lejuez et al., 2002) or the Iowa gambling task (Bechara et al., 1994).

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Moreover, follow-up studies could create more valuable insight by conducting field or physical lab studies in which respondents directly interact with various service robots, such as those presented in this study.

The above study focused on anthropomorphized service robots applied in the context of banking. As a result, our findings might not be generalizable to other settings, such as healthcare and tourism, in which experiential quality could be more essential due to different degrees of personal involvement. This could mean that respondents in such a context would react more sensitively to service robot anthropomorphism and feelings of uncanniness as compared to a bank service setting (Blut et al., 2021).

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