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Citation for final published version:

Dootson, Paula, Greer, Dominique, Letheren, Kate and Daunt, Kate ORCID: <https://orcid.org/0000-0002-6741-4924> 2022. Reducing deviant consumer behaviour with service robot guardians. Journal of Services Marketing 10.1108/JSM-11-2021-0400 file

Publishers page: <https://doi.org/10.1108/JSM-11-2021-0400>
<<https://doi.org/10.1108/JSM-11-2021-0400>>

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Reducing deviant consumer behaviour with service robot guardians

Journal:	<i>Journal of Services Marketing</i>
Manuscript ID	JSM-11-2021-0400.R1
Manuscript Type:	Article
Keywords:	Service innovation, customer deviance, robotics, servicescape

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Reducing deviant consumer behaviour with service robot guardians

Abstract

Purpose – Can service robots safeguard servicescapes from deviant consumer behaviour? Using Routine Activity Theory, this research examines whether increasing the perceived humanness of service robots reduces customer intentions to commit deviant consumer behaviour, and whether this negative relationship is mediated by perceived empathy and perceived risk of being caught.

Design/methodology/approach – Five hundred and fifty-three US residents responded to a hypothetical scenario that manipulated the humanness of a service agent (from self-service technology, to robot, to human employee) across seven conditions and measured the likelihood of deviant consumer behaviour, empathy towards the service robot, perceived risk of being caught and punished, and negative attitudes towards robots.

Findings – The results indicate that replacing human service agents with different types of service robots does inadvertently reduce customer perceptions of capable guardianship (i.e., the human element that deters potential offenders from committing crimes) in the servicescape and creates conditions that allow customers to perpetrate more deviant consumer behaviour.

Originality/value – Moving beyond research on customer adoption and use, this research examines the unintended consequences that might arise when deploying service robots in a technology-infused service environment. Humanised service robots offer more guardianship than self-service technology but do not replace human employees in preventing deviant consumer behaviour, as they remain more capable of deterring customer misbehaviour.

Practical implications – When investing in technology such as service robots, service providers need to consider the unintended cost of customer misbehaviour (specifically deviant consumer behaviour) in their return-on-investment assessments to optimise their asset investment decisions.

Keywords service innovation, consumer deviance, robotics, servicescape

1. INTRODUCTION

Emergent service technologies such as artificial intelligence, robotics and augmented reality are radically transforming the customer experience in service industries (Kunz, Heinonen and Lemmink, 2019). A significant breadth of research has examined the capability of a variety of service technologies across service industries such as retailing (Grewel *et al.*, 2017), hospitality (Ivanov *et al.*, 2019), healthcare (Čaić *et al.*, 2018) and education (Sisman and Kucuk, 2019). Indeed, the World Economic Forum (2020) estimates that by 2025, humans and machines will spend equal amounts of time performing service tasks at work.

Service robots, which are ‘system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organisation’s customers’ (Wirtz, Patterson, Kunz, Gruber, Lu, Paluch and Martins, 2018, p. 909), are increasingly replacing human service agents in an effort to improve productivity and cut costs (Marinova, de Ruyter, Huang, Meuter, and Challagalla, 2017; Mende, Scott, van Doorn, Grewel and Shanks, 2019). For example, robotic arms are serving coffee in CafeX (Cafesapp, 2021) and pizza in Paris (Chulain, 2021), while static humanoid robot Monty operates in a local café and food retailer (MontyCafe, 2021), and mobile humanoid robot Amy works in retail and hospitality (Quantum Robotics, 2021). It seems inevitable that interactions between service robots and customers will soon be more commonplace than interactions between human service agents and customers (Mende *et al.*, 2019; Wirtz *et al.*, 2018).

However, the economics behind investing in service robots is not as straightforward as claims suggesting that ‘robots are cheaper than human employees’ (Mortimer and Dootson, 2017). According to Beck and Hopkins (2016, p. 1080), ‘[o]ne of the unintended consequences of technological innovation is that it can promote opportunities for crime’. Historically, replacing frontline employees with self-service technologies in servicescapes saw huge rises in theft (Robinson, 2011; Silmalis, 2012; Beck, 2018; Beck, 2011), which was a cost not previously considered in the return-on-investment calculation. Concerningly, the introduction of self-service checkouts also saw the emergence of new types of shoplifters, including customers who would not normally shoplift but saw an opportunity to do so afforded by the new technology (Taylor, 2016). There is also risk to the service robots themselves (and by extension, the investment of the firm) as it is not uncommon for humans to abuse robots, whether that is a drunk person attacking a security service robot (BBC News, 2017), children kicking and punching a kindergarten robot (Bršćić *et al.*, 2015), or attempts to steal from delivery robots, which prompted the introduction a ‘screaming’ feature (Palermo, 2022). These examples suggest that consumers may alter their behaviour in costly and unfavourable ways as service robots replace human service agents.

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3 Despite the rapid diffusion of service robots across many service industries, there is relatively little
4 research exploring the unintended consequences of introducing technology-infused service experiences
5 to customers (Choi, Mattila and Bolton, 2021; Marinova *et al.*, 2017). Automation of any kind ‘changes
6 the nature of the work that humans do, often in ways unintended and unanticipated by the designers of
7 automation’ (Parasuraman and Riley, 1997, p. 231). By adding service robots to the service experience,
8 organisations may standardise service delivery and reduce errors of service provision through
9 automation (Huang and Rust, 2018; Wirtz *et al.*, 2018), but may also unintentionally remove a human
10 element that safeguards servicescapes from opportunistic customer misbehaviour (Daunt and Greer,
11 2015; Cohen and Felson, 1979; Schepers and Streukens, 2022). Thus, it is critical to understand how
12 the perceived humanness of different service robots impacts customer behaviour.
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20 Using Routine Activity Theory (RAT; Cohen and Felson, 1979), this research explores whether
21 replacing human service agents with different types of service robots may inadvertently reduce
22 customer perceptions of capable guardianship (i.e., the human element that deters potential offenders
23 from committing crimes) in the servicescape and create conditions that allow customers to perpetrate
24 more opportunistic crime. Specifically, we investigate whether increasing the perceived humanness of
25 a service robot reduces intentions to engage in deviant consumer behaviour, and whether this
26 relationship is mediated by empathy and the perceived risk of being caught and moderated by a negative
27 attitudes towards robots.
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34 There is an opportunity in the literature to move the service field beyond asking how we can increase
35 customer engagement with service robots to questioning whether this engagement will be positive and
36 how we might mitigate opportunities for consumer deviance. In addressing this research opportunity,
37 our work answers calls for research into service frontlines that are high in automated social presence
38 with embodied service robots (van Doorn *et al.*, 2017) compared to human employees (Mende *et al.*,
39 2019). Specifically, the research makes three main contributions to services literature. First, we present
40 the first study to directly examine the unintended consequences associated with the emergence of
41 service robots by investigating how customer propensity for deviant consumer behaviour is influenced
42 by robot humanness. In doing so, we answer a call for research into whether a humanised service robot
43 offers a perceived social presence that encourages obedience, as called for by Schepers and Streukens
44 (2022). Second, we uncover the psychological mechanisms that help explain the relationship between
45 perceived humanness and deviant consumer behaviour intentions (i.e., empathy, risk, and negative
46 attitudes towards robots). Third, we examine the role of non-human actors in the social dimension of
47 the servicescape, where only human actors have previously been considered as influencing customer
48 behaviour (Rosenbaum and Massiah, 2011). Practically, we offer guidelines for service providers
49 seeking to integrate service robots into a technology-infused servicescape around the need to enhance
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3 humanness, empathy for the robot, and perceived risk of being caught enacting deviant consumer
4 behaviour.
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8 In the next section, we review literature on the social presence of service robots and the role of perceived
9 humanness as a means of signalling capable guardianship as part of Routine Activity Theory (Cohen
10 and Felson, 1979). Next, we propose the mediating relationships of perceived empathy and perceived
11 risk of being caught and punished as mechanisms underpinning the perceived humanness of the service
12 robot and deviant consumer behaviour relationship. We then introduce the moderating role of a negative
13 attitudes towards robots, a psychological factor that impacts how customers interact with robots. We
14 present the mediation and moderation results before discussing the findings, implications, and future
15 research opportunities.
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23 2. THEORETICAL FRAMEWORK 24 25

26 The servicescape comprises four dimensions that influence how customers behave: a physical
27 dimension, a social dimension, a socially symbolic dimension, and a natural dimension (Rosenbaum
28 and Massiah, 2011). The social dimension focuses on how customers co-create value with employees
29 and the resulting impact on the customer experience (Silva *et al.*, 2021), perceptions of service quality
30 (Baker *et al.*, 1994), and customer's behavioural intentions to approach or avoid engaging with the
31 service providers (Rosenbaum and Montoya, 2007). Employee and customers' verbal and non-verbal
32 interactions make up the social dimension of a servicescape (Rosenbaum and Massiah, 2011). Most
33 existing research assumes that these service agents are human, but non-human service agents can also
34 be generated using technology and embedded in the servicescape (van Doorn *et al.*, 2017). For example,
35 technology such as chatbots or robots use artificial intelligence to participate in functional service
36 interactions and provide a level of automated social presence in the servicescape (Choi *et al.*, 2018; van
37 Doorn *et al.*, 2017). This automated social presence allows customers to feel that they are co-creating
38 with another social entity (Wirtz *et al.*, 2018).
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47 Social presence, which is the 'sense of being with another' (Biocca, Harms and Burgoon, 2003, p. 465),
48 can be created by non-human service agents when humans instinctively imbue inanimate objects with
49 human-like characteristics, intentions, motivations, and behaviours (Epley, Waytz and Cacioppo,
50 2007). This propensity is rooted in anthropomorphism, a psychological process in which individuals
51 use their knowledge of humans and self to inductively infer the properties of the non-human agent
52 (Epley *et al.*, 2007). Anthropomorphism facilitates interactions between human and non-human agents
53 by (a) allowing humans to explain and predict the complex stimuli presented by non-human agents and
54 (b) satisfying the human need for social connection by enabling connections with non-human agents
55 (Epley *et al.*, 2007). Although the extent of anthropomorphism varies somewhat between individuals
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3 (Epley *et al.*, 2007), this tendency to anthropomorphise is particularly salient when customers engage
4 with non-human agents such as service robots (Blut, Wang, Wunderlich and Brock, 2021).
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7 Service robots are a type of social robot designed to meaningfully interact with humans in a service
8 setting (Wirtz *et al.*, 2018). Service robots are rapidly acquiring new capabilities, such as sophisticated
9 natural language processing and biometric feature recognition (Wirtz *et al.*, 2018), that make them well-
10 suited to working with customers (Marinova *et al.*, 2017). Service robots tend to be used to fulfil either
11 customer service roles such as waiters or greeters, or operational roles such as baristas, surgical
12 assistants, or aged care assistants (Čaić *et al.*, 2018; Mettler, Sprenger, and Winter, 2017). While service
13 robots cannot wholly replace human service agents at this time, there are numerous contexts in which
14 the cognitive-analytical and emotional-social characteristics of the service delivery context would allow
15 service robots to operate without human service agents (Wirtz *et al.*, 2018).
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23 Service robots are designed with varying attributes of representation, anthropomorphism, and task
24 orientation (Wirtz *et al.*, 2018). First, robots can take a physical form (e.g., Yujin Robot's iRobi) or a
25 virtual form (e.g., Apple's Siri) (Wirtz *et al.*, 2018). Second, robots can be designed to appear humanoid
26 (e.g., Aldebaran's Nao robot) or non-humanoid (e.g., iRobot's Roomba) (Wirtz *et al.*, 2018). Finally,
27 robots can complete analytical tasks (e.g., image processing to assess mask compliance) or socio-
28 emotional tasks (e.g., greeting people) (Wirtz *et al.*, 2018). These robot attributes collectively influence
29 the service robot's perceived humanness, which becomes the 'interaction counterpart' for customers
30 (Wirtz *et al.*, 2018, p. 909).
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37 Perceived humanness is 'the extent to which an individual is seen as having characteristics that are
38 typical for humans' (Söderlund, 2021, p. 17). Service robots evoke perceived humanness through their
39 morphology, which might comprise a face, arms and legs, as well as human-like characteristics such as
40 warmth (Mende *et al.*, 2019; Söderlund, 2021). Perceived humanness distinguishes service robots from
41 self-service technologies that can perform functional tasks but cannot engage in social connection (Choi
42 *et al.*, 2018; van Doorn *et al.*, 2017). Thus, service robots are capable of being perceived as an employee
43 that forms part of the social dimension of a servicescape (Rosenbaum and Massiah, 2011).
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49 Research demonstrates that perceiving non-human agents as having human characteristics, intentions,
50 motivations, and behaviours fundamentally alters how individuals behave towards a non-human agent.
51 Specifically, the non-human agent may find that once it has been anthropomorphised, it may receive
52 increased generosity (Haley and Fessler, 2005), conferral of moral rights and respect (Epley *et al.*,
53 2007), increased perception of social presence (Gardner and Knowles, 2008; Haley and Fessler, 2005),
54 increased connectedness (Tam, Lee and Chao, 2012) and even mimicry of perceived personality traits
55 (Chartrand, Fitzsimons and Fitzsimons, 2008) and behavioural intentions (Aggarwal and McGill,
56 2012). However, it is not yet clear whether the increased conferral of moral rights, respect, perception
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3 of social presence and connectedness means that service robots are “human enough” to provide capable
4 guardianship in servicescapes to prevent opportunistic customer misbehaviour such as theft.
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7 Just as the dimensions and associated stimuli comprising a servicescape can influence customer
8 experiences and decision-making (Rosenbaum and Massiah, 2011), they can also inadvertently
9 influence the propensity for customer misbehaviour (Fisk *et al.*, 2010; Fullerton and Punj, 1993;
10 Fellesson, Salomonson and Aberg, 2013). A recent study found that service robots in a hospitality
11 context were perceived to signal safety in a servicescape impacted by the coronavirus (Schepers and
12 Streukens, 2022). Safety has been proposed as an additional, critical dimension of servicescapes
13 (Siguaw, Mai and Wagner, 2019; Schepers and Streukens, 2022), extending of the existing
14 conceptualisation of dimensions of servicescape mentioned earlier (Rosenbaum and Massiah, 2011).
15 Consistent with criminology literature, Siguaw and colleagues (2021) considered the role of physical
16 stimuli like cameras, security, and signage to signal personal safety at a university campus. Surveillance
17 tools (e.g., CCTV cameras, mirrors) and human employees, including regular staff and security guards,
18 have long been used to signal a space is being guarded, with a goal of deterring potential offenders from
19 making the servicescape ‘less safe’ for other customers (Beck and Palmer, 2011; Beck and Hopkins,
20 2016). While Schepers and Streukens (2022) focused on how service robots can keep people safe (from
21 coronavirus infection, in their context), research to date has not considered the service robot’s role as a
22 capable guardian. Schepers and Streukens (2022) call for further research to understand whether
23 humanistic service robots can influence safety compliance in a servicescape.
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35 According to Routine Activity Theory (Cohen and Felson, 1979), opportunistic customer misbehaviour
36 will occur in a servicescape when a motivated offender, a suitable target, and the absence of a capable
37 guardian converge in time and space. A motivated offender is a criminally inclined individual capable
38 of fulfilling their criminal inclinations (Cohen and Felson, 1979). Routine Activity Theory asserts that
39 all humans are capable of opportunistic crime if the opportunity were to present itself, and thus any
40 customer in a servicescape is a potential motivated offender (Daunt and Greer, 2015; Cohen and Felson,
41 1979). A suitable target is any object or person of sufficient (real or symbolic) value, visibility,
42 accessibility and low inertia to be desirable (Cohen and Felson, 1979). A capable guardian is any
43 mechanism that would prevent a direct contact predatory violation (e.g., service employees, security
44 guard, police officer, surveillance CCTV, etc.) (Cohen and Felson, 1979; Cardone and Hayes, 2012).
45 Capable guardians bring a human presence to the servicescape to prevent opportunistic crime (Beck
46 and Hopkins, 2016; Cohen and Felson, 1979). To date, Routine Activity Theory has been applied to
47 explain the behaviour of human social agents, but could reasonably be extended to investigate the
48 guardianship role that service robots might play given their perceived humanness.
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2.1. Hypothesis Development

2.1.1. Humanisation of service robots

As human presence is known to prevent opportunistic crime (Daunt and Greer, 2015; Cohen and Felson, 1979), we investigate whether the perceived humanness of the service robot influences the intentions of customers to commit deviant consumer behaviour when a suitable target is available. Acknowledging that service robots vary widely in their representation, anthropomorphism, and task orientation (Wirtz *et al.*, 2018) and thus potentially vary in perceived humanness, we posit that more human-like service robots can act as capable guardians to prevent customer theft. Thus, we propose the following hypothesis:

Hypothesis (H1). As the perceived humanness of the service agent increases, intentions to commit deviant consumer behaviour decrease.

2.1.2. The mediating role of empathy and perceived risk of being caught and punished

As customers begin to humanise service robots and consider them capable guardians, both emotional and cognitive processes may be invoked that explain subsequent intentions not to engage in opportunistic customer misbehaviour. One important emotional outcome that may occur when customers anthropomorphise service robots is empathy (Airenti, 2015). Batson and colleagues (1995, p. 1042) define empathy as an 'other-oriented emotional response congruent with the perceived welfare of another person'. When a customer's anthropomorphic tendencies are triggered, empathy for the agent can manifest. Empathy occurs when an individual can understand another's experience from their point of view (Bellet and Maloney, 1991).

The empathy-altruism hypothesis proposes that when an individual experiences empathic emotion, it evokes an altruistic motivation towards the person for whom empathy is felt (Batson *et al.*, 1989, 1995, 2011). This empathy-induced altruism is thought to increase moral, prosocial behaviour (Batson *et al.*, 1995, 2011), suggesting that empathy for a social agent in a servicescape may suppress the urge to act on any opportunity the servicescape presents for theft. We propose that empathy mediates the influence of perceived humanness on deviant consumer behaviour intentions, such that empathy is the underlying mechanism explaining the negative relationship between the perceived humanness of the service agent and deviant consumer behaviour intentions. Thus, we propose the following hypothesis:

Hypothesis (H2). Empathy mediates the negative relationship between perceived humanness of the service agent and deviant consumer behaviour intentions.

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3 Furthermore, an important cognitive outcome that emerges when customers anthropomorphise service
4 robots and consider them capable guardians is the perceived risk of getting caught engaging in deviant
5 consumer behaviour. Increasing the perceived risk of being caught and punished for engaging in deviant
6 consumer behaviour is a common approach to deterrence because it minimises perceived opportunity
7 (Cohen and Felson, 1979). Deterrence theory, from the classical school of criminology (Beccaria, 1963;
8 Bentham, 1967), argues that people weigh up the costs and benefits of engaging in a specific action
9 (Pratt *et al.*, 2010). If a customer perceives legal sanctions (e.g., arrest, imprisonment, fines) as certain,
10 severe, and swift, they will be deterred from engaging in illegal behaviour (Akers and Sellers, 2004;
11 Grasmick and Green, 1980). Enhancing this sense of risk is why capable guardians like security guards
12 have an influence: they serve to highlight the likelihood of being caught (Daunt and Greer, 2015; Beck
13 and Hopkins, 2016).
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22 Therefore, we propose that the perceived risk of being caught and punished is a likely mediator of
23 deviant consumer behaviour where the service robot is humanised to the degree it is considered a
24 capable guardian. Like empathy, perceived risk requires an evaluation to take place (in this case, of the
25 situation and risk to the self, as opposed to evaluations of an agent). Thus, we propose the following
26 hypothesis:
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31 **Hypothesis (H3).** Perceived risk mediates the negative relationship between perceived humanness of
32 the service agent and deviant consumer behaviour intentions.
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35 **2.1.3. The moderating role of negative attitudes towards robots**

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38 Humanisation of robots does not always produce positive outcomes. Humanisation can trigger a sense
39 of competition and result in the humanised object being perceived as a threat or adversary (Yang,
40 Aggarwal, and McGill, 2020). When threatened, customers can react and behave in a manner opposite
41 to the desired, normative behaviour of the situation. A negative attitudes towards robots is a
42 “psychological factor that impacts how customers interact with robots” (Nomura, Kanda and Suzuki,
43 2006, p. 138). Negative attitudes towards robots are a psychological predisposition that impact how
44 people assess the situation where the robot-human interaction is happening, the social influence of the
45 robot, and the emotional reactions the interaction inspires (Nomura *et al.*, 2006; 2008; Blut *et al.*, 2021).
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52 While negative attitudes towards robots do not capture anxiety surrounding technology use, they
53 capture a negative attitudes specific to the robot itself (Blut *et al.*, 2021). People who report highly
54 negative attitudes towards robots feel uncomfortable interacting with them due to their general dislike
55 for robots (Blut *et al.*, 2021). In this research, we hypothesise that negative attitudes towards robots are
56 a psychological factor that will strengthen the negative relationship between perceived humanness of
57 the service agent (who is likely to embody different levels of robotic and human elements) and deviant
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3 consumer behaviour intentions, such that highly negative attitudes towards robots would likely intensify
4 the negative relationship between a lack of perceived humanness and deviant consumer behaviour
5 intentions. Thus, we propose the following hypothesis:
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9 **Hypothesis (H4).** Negative attitudes towards robots will moderate the relationship between perceived
10 humanness of the service agent and deviant consumer behaviour intentions, such that negative attitudes
11 towards robots will strengthen the negative relationship.
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14 15 **3. METHOD**

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17 A scenario-based experiment was designed to test the hypotheses in a technology-infused service
18 encounter. The experiment was conducted in the financial services context as it offers routine
19 activities that create a ‘convergence in time and space giving people the opportunity for deviance’,
20 consistent with the theoretical requirements for examining Routine Activity Theory (Cohen and
21 Felson, 1979). Banking is a universally undertaken service. We manipulated the level of humanness
22 via three types of guardian stimuli, resulting in seven conditions of varying humanness (three ATMs,
23 three humanoid service robot agents, and a human bank teller), as detailed in the Design section of the
24 paper. While all stimuli were intended to function as guardians, the level of humanness for each
25 stimulus functioned on a continuum, making it likely that some stimuli would be perceived as
26 possessing more guardian-like qualities (i.e., humanness, enhanced empathy, enhanced risk) than
27 others.
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36 37 **3.1 Design**

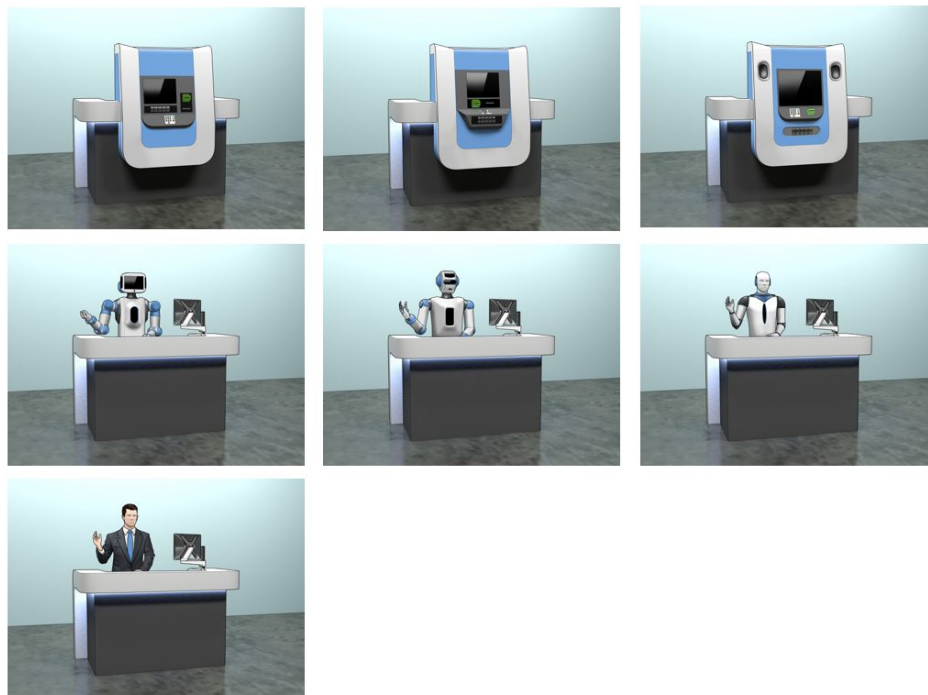
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39 Following the online data collection methods reported by recent social science experiments (Miller *et*
40 *al.*, 2021; Park *et al.*, 2021), five hundred and fifty-three US residents (48.7% female, 60% aged 18-
41 34yo) were recruited from Amazon Mechanical Turk to complete a 5-10-minute survey on Qualtrics.
42 MTurk offers similar levels of internal and external validity to experiments conducted via lab and field
43 (Horton *et al.*, 2011) and produces data quality on-par with or superior to traditional online panels or
44 student samples (Kees, Berry, Burton, and Sheehan, 2017). While MTurk is noted as a source for high
45 quality, reliable data (Buhrmester, Kwang, and Gosling, 2015) and high levels of participant attention
46 (Hauser and Schwarz, 2016), we also adopted additional measures to ensure data quality – including
47 following best practice by recruiting only those participants with very high approval ratings (95%+)
48 and applying stringent data cleaning prior to analysis commencing. To ensure ethical data collection,
49 participants were compensated USD 1.20, a rate slightly exceeding minimum wage at the time of data
50 collection. Respondents completed demographic questions, then read and responded to a hypothetical
51 scenario containing one of the stimuli, completed a manipulation check, and answered survey questions
52 on the foci constructs of the study. The submission of the survey implied informed consent.
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3 Participants were randomly allocated to one of seven conditions: an ATM, a subtle humanised ATM,
4 an explicit humanised ATM, a humanised service robot (cute), a humanised service robot (mechanical),
5 a humanised service robot (android), and a human bank teller (see Figure I). The seven conditions
6 represent variations in the humanoid nature of the service agent as per the work of Piçarra and Giger
7 (2018). The ATM stimuli were modified in line with Kim and McGill (2011), manipulating the design
8 to show subtle human face features (e.g., eyes and mouth), which research has consistently shown will
9 increase perceived *human-likeness* of a robot (Blut *et al.*, 2021). The visual elements not relevant to the
10 manipulation were kept homogenous (e.g., lighting, desk, colour). A manipulation check was conducted
11 to assess humanness did vary across conditions using a one-way between subjects Analysis of Variance
12 (ANOVA) test. An ANOVA found perceptions of humanness differed significantly across the ATM (M
13 = 1.90; $SD = 1.52$), a subtle humanized ATM ($M = 2.16$, $SD = 1.75$), an explicit humanized ATM (M
14 = 2.77, $SD = 1.54$), a humanized robot (cute) ($M = 2.96$, $SD = 1.53$), a humanized robot (mechanical)
15 ($M = 3.33$, $SD = 1.42$), a humanized robot (android) ($M = 3.95$, $SD = 1.57$), and a human bank teller
16 ($M = 5.08$, $SD = 1.29$) conditions ($F(6, 555) = 40.57$, $p = 0.000$). A post-hoc Tukey HSD test identified
17 that the conditions differed significantly at $p < 0.05$; specifically, the ATM condition, a humanised robot
18 (android) condition, and human condition differed, with varying differences between the other
19 conditions. Clustering the conditions to ATM, robot, and human found perceived humanness differed
20 significantly ($F(2, 555) = 101.62$, $p = 0.000$) suggesting respondents distinguished three clear types of
21 service agents in the servicescape: self-service technology, robot, human.
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35 All items in the survey were measured on a 7-point Likert scale. The independent variables included
36 the following. The dependent variable, *deviant consumer behaviour intentions*, was measured using a
37 hypothetical scenario: “Sam withdraws some cash from [an ATM next door to the bank/a bank]. Sam
38 notices the [ATM/robot/teller] dispenses an additional \$20 note, with no charge to their account. The
39 scenario was followed by a one-item question asking respondents to rate the likelihood that Sam would
40 keep the money, on a seven-point Likert scale of very unlikely (1) to very likely (7). Using a third-
41 person technique allowed the respondent to transfer his or her own attitudes towards the third person to
42 explain that person’s behaviour (Zikmund *et al.*, 2011). Each hypothetical scenario is matched with one
43 of the experimental conditions of a service agent. *Humanness* ($\alpha = 0.96$) was operationalised as a mean
44 response to four items: the [ATM/robot/teller] were not at all similar/very similar to Sam, not at all like
45 a human/very much like a human, not at all like a person/very much like a person, does not at all
46 resemble a human/very much like a human. *Empathy* ($\alpha = 0.95$) was operationalised as a mean response
47 to six items, based on how they thought Sam felt about the scenario: sympathetic, soft-hearted, warm,
48 compassionate, tender, moved (Batson *et al.*, 1995). *Perceived risk* ($\alpha = 0.67$) was measured using an
49 adaption of Grasmick and Green’s (1980) perceived probability of being caught and perceived severity
50 of punishment measures as used in (Dootson, Johnston, Beatson and Lings, 2016). To capture perceived
51 probability of being caught, respondents were asked “If Sam chose to keep the \$20: how likely is it Sam
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would get caught?” and were required to answer on a 7-point Likert scale from very unlikely (1) to very likely (7). To capture perceived severity of punishment, respondents were asked “If Sam chose to keep the \$20: how severe would Sam's punishment be?” and were required to answer on a 7-point Likert scale from not at all severe (1) to very severe (7). The *negative attitudes towards robots* scale ($\alpha = 0.77$) was operationalised as a mean response to 14 items, including statements such as: “I would feel uneasy if robots really had emotions”, “I would feel very nervous just standing in front of a robot”, and “I would feel paranoid talking to a robot” (Nomura *et al.*, 2006).

FIGURE I. Stimuli for experiments



4. RESULTS

4.1 Descriptive statistics

Table I presents the means, standard deviations, and bivariate correlations to examine the state and relationships between constructs for all study variables.

[Insert TABLE I. here]

4.2 Testing mediated moderation

To test H1-4, Hayes' (2017) PROCESS Model 5 (bootstrap estimation with 5,000 resamples) was run. The mediated moderation model was significant (see Figure II). First, there was a significant negative main effect of perceived humanness of service agent on deviant consumer behaviour intentions, ($b = -0.61, p = 0.00$). Significant indirect effects were present for both empathy ($b = -0.08, SE = 0.02; 95\% CI = -0.12, -0.05$) and risk ($b = -0.06, SE = 0.02; 95\% CI = -0.1, -0.03$). The total effect was also significant ($b = -0.25, SE = 0.04; 95\% CI = -0.33, -0.17$). Analyses indicate a partial mediation. Hypotheses 1, 2 and 3 were therefore supported.

For the moderator, a significant interaction effect is apparent, supporting hypotheses 1 and 4. Figure III illustrates the pattern of interaction. For individuals low in negative attitudes towards robots (1SD below the mean), the perceived humanness of the service agent had a negative association with their deviant consumer behaviour intentions ($b = -0.26, SE = .05, p < .001, 95\% CI = [-0.36, -0.16]$). When negative attitudes towards robots was at the mean level, a negative association between the two constructs ($b = -0.12, SE = .04, p < .001, 95\% CI = [-0.20, -0.04]$) was observed. For those who were high in negative attitudes towards robots (1SD above the mean), the perceived humanness of the service agent had a positive association with deviant consumer behaviour intentions ($b = 0.02, SE = .05, p = 0.67, 95\% CI = [-0.09, 0.13]$), however, it was not significant. To further examine this finding, a Johnson-Neyman analysis was conducted. The Johnson-Neyman analysis indicates that the moderator has a significant influence for those participants who scored between 1.00 and 4.23 (58.3% of the sample), or above 6.19 out of 7.00 (2.3% of the sample) on the negative attitudes towards robots scale. For those outside of these ranges, the line slope is not different from zero, suggesting that the relationship between perceived humanness of service agent and deviant consumer behaviour intentions becomes non-significant.

In essence, the final model indicates that consumers are less likely to harbour opportunistic theft intentions if a robot looks more human, as partially explained by their empathy for the robot and their heightened sense of perceived risk. Consumer negative attitudes towards robots do influence the

relationship between humanness and intended deviance, but this effect is significant only for those who exhibit lower (below 4.23) or very high (above 6.19) scores for negative attitudes towards robots.

FIGURE II. Mediated moderation model - negative attitudes towards robots moderating the perceived empathy and perceived risk mediated relationship between humanness and deviant consumer behaviour intentions.

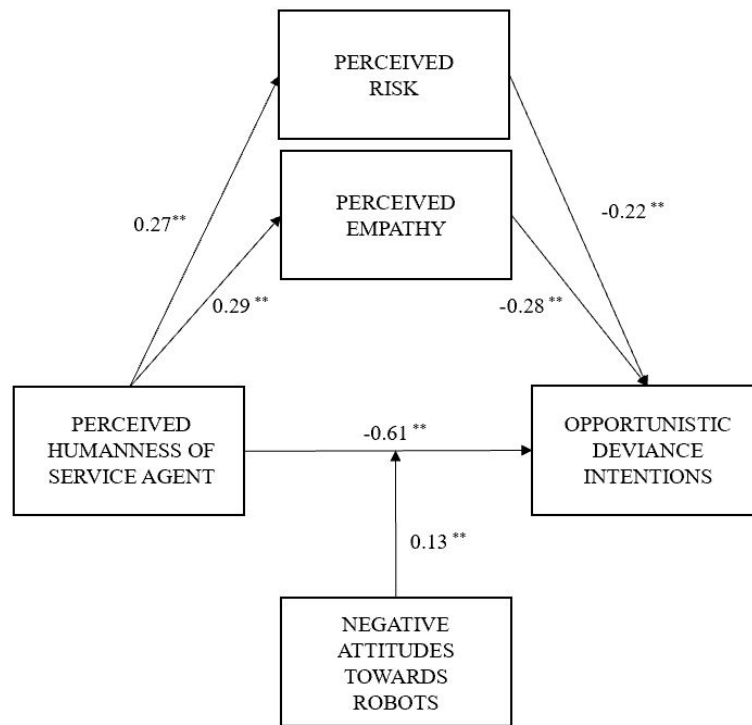
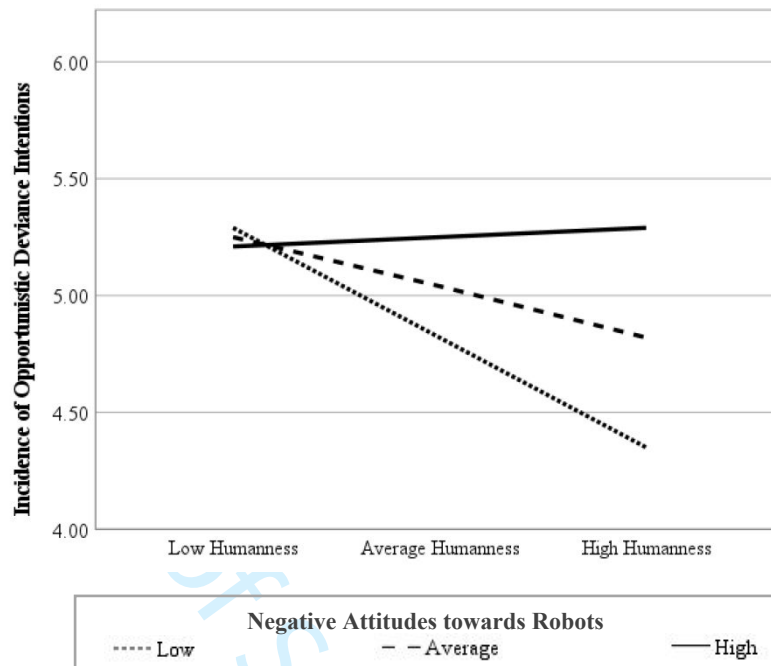


FIGURE III. Interaction for mediated moderation



5. DISCUSSION

Given the increasing prevalence of service agents operating in technology-infused service encounters (e.g., in banking, hospitality industries), opportunities for consumer deviance have steadily grown over the last decade in line with new technology development. Indeed, there has been very little research examining any of the unintended consequences of the rapid introduction of service robots (Choi *et al.*, 2021; Marinova *et al.*, 2017). Applying the lens of Routine Activity Theory (Cohen and Felson, 1979), this research contributes to this stream of enquiry by directly examining the unintended consequence of deviant consumer behaviour, as well as uncovering psychological mechanisms explaining how theft propensity can vary by individual characteristic (e.g., negative robot attitudes), individual evaluations (e.g., empathy, risk), and the perceived guardianship in the design of the robot (e.g., humanness).

We find that introducing service robots into the service environment in place of human service agents does reduce customer perceptions of capable guardianship, contributing to conditions that lead to more deviant consumer behaviour in the service environment. The potential increase in deviant consumer behaviour is alleviated (though not eliminated) by increased humanness in service robots. This relationship between perceived robot humanness and intentions to perpetrate deviant consumer behaviour was explained by empathy towards the service robot and the perceived risk of being caught and punished. These partially mediated relationships were moderated by a negative attitudes towards

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3 robots, which strengthened the humanness-empathy, and humanness-risk relationships and weakened
4 the humanness-deviance relationship when perceived humanness was low. These findings directly
5 contribute to an enhanced understanding of how and why service agents can replace human employees
6 as capable guardians in the servicescape to reduce opportunities for consumer deviance. Specifically,
7 guardianship can be achieved by designing non-human service agents to embody human characteristics,
8 which thus engender empathy and trigger a risk perception of being caught engaging in deviance
9 (conditional upon the customer lacking negative attitudes towards robots).
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14 15 **5.1. Theoretical implications**

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18 By investigating the impact of the perceived humanness of the service robot, we make several key
19 contributions to the service field. First, we extend the literature in robotics and services beyond
20 examining customer adoption of service robots (e.g., Park *et al.*, 2021; Sheehan *et al.*, 2020; Wirtz *et*
21 *al.*, 2018) to consider how customers respond to technology-infused service experiences. To date,
22 ‘specific reactions to humanoid versus human service providers have not been widely examined’
23 (Mende *et al.*, 2019). This is especially important in servicescapes where customers do not have a choice
24 in how they interact with the organisation – either via a human, service robot, or traditional self-service
25 technology. Our research suggests the introduction of these different technologies into the servicescape
26 can alter customer behaviour in unintended ways. Specifically, our comparison of a human employee,
27 service robot, and traditional self-service technology saw increasing rates of deviant consumer
28 behaviour intentions across each of the three categories, respectively. Our research suggests perceived
29 humanness of a service robot impacts intentions for deviant consumer behaviour, such that humanoid
30 robots have some capacity to represent capable guardianship in the servicescape, thereby deterring more
31 deviant consumer behaviour in comparison to self-service technology. However, the findings also
32 suggest that a humanoid service robot is not a direct replacement of a human employee as a capable
33 guardian, as it deterred less deviant consumer behaviour than a human service agent. Therefore, a
34 second contribution of the work is in extending the applicability of Routine Activity Theory (Cohen
35 and Felson, 1975) in explaining non-human actors as guardians that reduce instances of deviance, where
36 previous research using the theory has focused only on human guardians (e.g., Daunt and Greer, 2015).
37 Similarly, the research extends our existing understanding of the social dimension of a servicescape
38 proposed by Rosenbaum and Massiah (2011), by considering customer interactions with non-human
39 agents rather than human agents. The social dimension of a servicescape will continue to evolve as
40 organisations increasingly replacing human service agents with non-human agents (Marinova *et al.*,
41 2017), which warrants ongoing research on how human and non-human agents co-create value. Third,
42 we answer the call for additional research into service frontlines high in automated social presence
43 using embodied humanoid service robots (van Doorn *et al.*, 2017). Such social robots embrace
44 appropriate norms of behaviour for their role (van Doorn *et al.*, 2017) and thus encourage customers to
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3 uphold and reciprocate those social norms of behaviour. Consequently, the research findings answer a
4 call for research to understand whether a service robot offers a social presence to encourage obedience
5 with servicescape rules and norms (Schepers and Streukens, 2022). Our research finds humanoid
6 service robots do have capacity to encourage obedience, through capable guardianship, but not with the
7 same effectiveness as a human.
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11 12 **5.2. Managerial implications** 13 14

15 Practically, this research considers how to best mitigate and manage incidences of deviant consumer
16 behaviour in technology-infused service environments (Choi *et al.*, 2021; Marinova *et al.*, 2017). The
17 findings in this research provide guidelines for designing-out deviance towards service robots and
18 suggest that managers have two levers to mitigate the extent of deviant consumer behaviour intentions
19 with employing service robots: perceived risk or enhanced empathy. Robotic service agents are unique
20 in that they offer the ability to design compliance and security into the robotic employee (Wirtz and
21 Zeithaml, 2018) to increase perceived guardianship through empathy and risk and reduce instances of
22 deviant consumer behaviour. Using a 'risk' lever involves introducing service robots as guardians that
23 signal the same perceived risk as having a human employee without triggering reactance from
24 customers (i.e., avoiding feelings of limited choice, or the forced use of service robots over humans),
25 which was observed with the introduction of cameras on self-service checkouts where customers felt
26 unnecessarily surveilled (Mortimer and Dootson, 2020). Conversely, using the 'empathy' lever involves
27 humanising the design of the service robot to engender empathy in customers and signal social closeness
28 to reduce deviant consumer behaviour intentions of customers, such as more human-like features and
29 speech (e.g., Sheehan, Jin and Gottlieb, 2020).
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40 The research findings also have implications for organisations calculating return-on-investment of
41 service robot agents, where potential loss stemming from a reduced perception of capable
42 guardianship in the servicescape needs to be accounted for as a cost alongside acquisition,
43 programming, and maintenance of the service robot. While the reasons to introduce technologies into
44 the servicescape are, for the most part, economically compelling, there is little consideration in
45 literature and in practice for the unintended consequences of deviant consumer behaviour intentions
46 (Mortimer and Dootson, 2017). Given the link between new technologies and customer misbehaviour
47 established in this work, it is possible that to save wage costs, managers may instead increase costs
48 associated with deviant consumer behaviour and other customer misbehaviours, due to the removal of
49 a capable guardian in the service environment. A recent survey of Australian retailers found that
50 losses of \$3.37 billion (0.92% of revenue) affect the retail sector each year from crime (ARA, 2019).
51 Our findings indicate that the presence of a person or humanised robot is the most effective guardian.
52 To help practitioners with considering the ROI, a junior retail worker in Australia earns about \$44,000
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3 per year plus oncosts (Fair Work Ombudsman, 2022), while a humanised robot like a Pepper costs
4 about \$44,000 to purchase (R4 Robotics, 2022) and then varying maintenance costs depending on
5 level of service. Otherwise, robots like Amy can be leased for \$40 per day (Quantum Robotics, 2022).
6 Therefore, a business can calculate its potential ROI by considering its total revenue, the costs
7 associated with different types of guardians over the years, and whether the guardians needed cost less
8 than 0.92% of revenue. There is also the option of working with self-service checkout manufacturers
9 to 'humanise' the design – as self-checkouts are often already in operation, so the costs of incremental
10 small design changes may be minimised.
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17 We recommend not only adding human features to new technology-infused servicescapes, but also
18 extensively testing the robot service agents in a series of market tests before roll-out. Unintended
19 consequences could be costs incurred from more than just theft, but also damage to the technology,
20 misuse, needing to reprogram, cost of shrinkage or additional labour because of the specific technology
21 used (e.g., Brščić *et al.*, 2015).
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27 **5.3. Limitations and future research**

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29 This research has several limitations and opportunities for future research. The research involves
30 scenario-based experiments. Although scenario-based experiments are widely used in the study of
31 customer misbehaviour due to their methodological and ethical appropriateness, they lack external
32 validity. The findings are generalisable to lab studies examining consumer deviance in routine
33 activities (e.g., withdrawing money from the bank), however, future research could consider other
34 routine activities across other contexts where service robots are being introduced, and where there is
35 significant potential for consumer deviance, such as hospitality, retail, and government services.
36 While future consumer deviance and service robot research would benefit from observational studies
37 in servicescapes, it raises some ethical challenges around deception, rule-breaking, and illegal
38 behaviour (National Health and Medical Research Council, 2018). One way to mitigate the ethical
39 challenges of studying deviant consumer behaviour is by using virtual reality lab experiments, which
40 are proving useful in understanding non-compliant or deviant decision-making in other contexts (e.g.,
41 Kinateder, Müller, Jost, Mühlberger and Pauli, 2014) as the virtual reality scenarios are realistic and
42 can trigger realistic feelings in study participants about the subject matter (Feng *et al.*, 2018). Further,
43 despite existing research looking at 'humanness' being embedded into robot design in the robotics
44 fields (e.g., Roesler *et al.*, 2021), there appears to be more to explore in services research to explain
45 why customers are likely to engage in deviant consumer behaviour intentions towards service robot,
46 such as perceptions of trust, guilt, and justifications (Kim, Lee, Lee and Duhachek, 2019). Given that
47 the mediated relationships in this study were partial, it is suggested that other work may build on the
48 presented model by seeking other mediators to fully explain the relationship. Finally, future research
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3 could perform active manipulation of the target suitability and guardianship variables to offer a deeper
4 understanding of each dimension's mechanisms and role in explaining and mitigating deviant
5 consumer behaviour intentions towards service robots under Routine Activity Theory.
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55
56
57
58
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60

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References

- Aggarwal, P., and McGill, A. L. (2012), "When brands seem human, do humans act like brands? Automatic behavioral priming effects of brand anthropomorphism", *Journal of Consumer Research*, Vol. 39 No. 2, pp. 307-323.
- Airenti, G. (2015), "The cognitive bases of anthropomorphism: from relatedness to empathy", *International Journal of Social Robotics*, Vol. 7. No. 1, pp. 117-127.
- Akers, R. L., and Sellers, C. S. (2004), *Criminological Theories: Introduction, Evaluation, and Application*. Los Angeles, CA: L Roxbury Publishing.
- Australian Retailers Association (ARA) (2019), "Customer theft hits new heights as retail industry crime costs businesses \$3.37 billion", available at: <https://blog.retail.org.au/newsandinsights/customer-theft-hits-new-heights-as-retail-industry-crime-costs-businesses-3.37-billion>
- Baker, J., Grewal, D. and Parasuraman, A. (1994), "The influence of store environment on quality inferences and store image", *Journal of the Academy of Marketing Science*, Vol. 22 No. 4, pp. 328-39.
- Batson, C. D., Klein, T. R., Highberger, L., and Shaw, L. L. (1995), "Immorality from empathy-induced altruism: When compassion and justice conflict. *Journal of personality and social psychology*", Vol. 68 No. 6, pp. 1042.
- Batson, C.D. (2011), *Altruism in humans*. Oxford University Press, USA.
- Batson, C.D., Batson, J.G., Griffitt, C.A., Barrientos, S., Brandt, J.R., Sprengelmeyer, P. and Bayly, M.J., (1989), "Negative-state relief and the empathy—altruism hypothesis", *Journal of Personality and Social Psychology*, Vol. 56 No. 6, pp. 922.
- BBC News (2017), "Silicon Valley Security Robot Attacked by Drunk Man – Police", available at: <https://www.bbc.com/news/world-us-canada-39725535>
- Beccaria, C. (1963), *On Crimes and Punishments* (H. Paolucci, Trans.), New York, NY: Free Press.
- Beck, A (2018), *The Rise of Self-checkout in Retailing: Understanding the Risk and Managing the Problem*, Leicester: Erudite Publishing.
- Beck, A. (2011), "Self-scan Checkouts and Retail Loss: Understanding the Risk and Minimising the Threat", *Security Journal*, Vol. 24 No. 3, pp. 199-215.
- Beck, A., and Hopkins, M. (2017), "Scan and rob! Convenience shopping, crime opportunity and corporate social responsibility in a mobile world", *Security Journal*, Vol. 30 No. 4, pp. 1080-1096.
- Beck, A., and Palmer W. (2011), "The Importance of Visual Situational Cues and Difficulty of Removal in Creating Deterrence: The Limitations of Electronic Article Surveillance Source Tagging in the Retail Environment", *Journal of Applied Security Research*, Vol. 6 No. 1, pp. 110-123.
- Bellet, P. S., and Maloney, M. J. (1991), "The importance of empathy as an interviewing skill in medicine", *Jama*, Vol. 266 No. 13, pp. 1831-1832.
- Bentham, J. (1967), *A Fragment on Government and an Introduction to the Principal of Morals and Legislation*. Oxford, UK: Basil Blackwell.
- Biocca, F., Harms, C., and Burgoon, J. K. (2003), "Toward a more robust theory and measure of social presence: Review and suggested criteria", *Presence: Teleoperators and virtual environments*, Vol. 12 No. 5, pp. 456-480.
- Blut, M., Wang, C., Wunderlich, N. V., and Brock, C. (2021), "Understanding anthropomorphism in service provision: a meta-analysis of physical robots, chatbots, and other AI", *Journal of the Academy of Marketing Science*, Vol. 49, pp. 632–658.

- 1
2
3 Brščić, D., Kidokoro, H., Suehiro, Y., and Kanda, T. (2015, March). "Escaping from children's abuse
4 of social robots", In *Proceedings of the Tenth Annual ACM/IEEE International Conference*
5 *On Human-Robot Interaction* (pp. 59-66).
6
- 7 Buhrmester, M., Kwang, T., and Gosling, S. D. (2015). "Amazon's Mechanical Turk: A new source
8 of inexpensive, yet high-quality data?" In *Methodological issues and strategies in clinical*
9 *research* (4th ed.). (pp. 133–139).
10
- 11 Cafesapp (2021), "CafeX: The fastest, most advanced fully automated café system", available at
12 <https://cafexapp.com/>
- 13 Čaić, M., Odekerken-Schröder, G. and Mahr, D. (2018), "Service Robots: Value Co-creation and Co-
14 deconstruction in Elderly Care Networks", *Journal of Service Management*, Vol. 29 No. 2,
15 pp.178-205.
16
- 17 Cardone, C. and Hayes, R. (2012), "Shoplifter perceptions of store environments: An analysis of how
18 physical cues in the retail interior shape shoplifter behaviour", *Journal of Applied Security*
19 *Research*, Vol. 7 No. 1, pp. 22–58.
- 20 Chartrand, T. L., Fitzsimons, G. M., and Fitzsimons, G. J. (2008), "Automatic effects of
21 anthropomorphized objects on behavior", *Social Cognition*, Vol. 26, No. 2, pp. 198-209.
- 22 Choi, S., Mattila, A. S., and Bolton, L. E. (2021), "To err is human (-oid): how do consumers react to
23 robot service failure and recovery?", *Journal of Service Research*, Vol. 24 No. 3, pp. 354-
24 371.
25
- 26 Chulain (2021), "Paris welcomes first pizzeria staffed entirely by robot pizza chefs", available at
27 [https://www.euronews.com/next/2021/07/08/paris-welcomes-first-pizzeria-operated-entirely-](https://www.euronews.com/next/2021/07/08/paris-welcomes-first-pizzeria-operated-entirely-by-robots)
28 [by-robots](https://www.euronews.com/next/2021/07/08/paris-welcomes-first-pizzeria-operated-entirely-by-robots)
- 29
- 30 Cohen, L. E., and Felson, M. (1979), "Social change and crime rate trends: A routine activity
31 approach", *American Sociological Review*, pp. 588-608.
- 32 Daunt, K. L., and Greer, D. A. (2015), "Unpacking the perceived opportunity to misbehave: The
33 influence of spatio-temporal and social dimensions on consumer misbehavior", *European*
34 *Journal of Marketing*, Vol. 49 No. 9/10, pp. 1505-1526.
35
- 36 Dootson, P., Johnston, K. A., Beatson, A., and Lings, I. (2016), "Where do consumers draw the line?
37 Factors informing perceptions and justifications of deviant consumer behaviour", *Journal of*
38 *Marketing Management*, Vol. 32 No. 7-8, pp. 750-776.
- 39 Epley, N., Waytz, A., and Cacioppo, J. T. (2007), "On seeing human: a three-factor theory of
40 anthropomorphism", *Psychological Review*, Vol. 114 No. 4, pp. 864-886.
- 41 Fair Work Ombudsman (2022), "Junior pay rates", available at: [https://www.fairwork.gov.au/pay-](https://www.fairwork.gov.au/pay-and-wages/minimum-wages/junior-pay-rates)
42 [and-wages/minimum-wages/junior-pay-rates](https://www.fairwork.gov.au/pay-and-wages/minimum-wages/junior-pay-rates)
- 43 Fellessom, M., Salomonson, N., and Åberg, A. (2013), "Troublesome travellers—the service system as
44 a trigger of customer misbehaviour", *International Journal of Quality and Service Sciences*.
45 Vol. 5 No. 3, pp. 256-274.
46
- 47 Feng, Z., González, V. A., Amor, R., Lovreglio, R., and Cabrera-Guerrero, G. (2018). Immersive
48 virtual reality serious games for evacuation training and research: A systematic literature
49 review. *Computers and Education*, 127, 252-266.
50
- 51 Fisk, R., Grove, S., Harris, L. C., Keeffe, D. A., Daunt, K. L., Russell-Bennett, R., and Wirtz, J.
52 (2010). Customers behaving badly: a state of the art review, research agenda and implications
53 for practitioners. *Journal of Services Marketing*. Vol. 24 No. 6, pp. 417–429.
- 54 Fullerton, R. A., and Punj, G. (1993), "Choosing to misbehave: A structural model of aberrant
55 consumer behavior", pp. 570-574 in *NA - Advances in Consumer Research* Vol. 20, eds.
56 Leigh McAlister and Michael L. Rothschild, Provo, UT: Association for Consumer Research.
57
58
59
60

- 1
2
3 Gardner, W. L., and Knowles, M. L. (2008), "Love makes you real: Favorite television characters are
4 perceived as "real" in a social facilitation paradigm", *Social Cognition*, Vol. 26 No. 2, pp.
5 156-168.
6
7 Grasmick, H. G., and Green, D.E. (1980), "Legal Punishment, Social Disapproval and Internalization
8 as Inhibitors of Illegal Behavior", *The Journal of Criminal Law and Criminology*, Vol. 71 No.
9 3, pp. 325-335.
10
11 Grewal, D., Roggeveen, A. L., and Nordfält, J. (2017), "The future of retailing", *Journal of*
12 *Retailing*, Vol. 93 No. 1, pp. 1-6.
13
14 Haley, K. J., and Fessler, D. M. (2005), "Nobody's watching?: Subtle cues affect generosity in an
15 anonymous economic game", *Evolution and Human Behavior*, Vol. 26 No. 3, pp. 245-256.
16
17 Hauser, D. J., and Schwarz, N. (2016), "Attentive turkers: MTurk participants perform better on
18 online attention checks than do subject pool participants", *Behavior Research Methods*, Vol.
19 48 No. 1, pp. 400-407.
20
21 Hayes, A. F. (2017), *Introduction to mediation, moderation, and conditional process analysis: A*
22 *regression-based approach*. Guilford publications.
23
24 Horton, J. J., Rand, D. G., and Zeckhauser, R. J. (2011), "The online laboratory: Conducting
25 experiments in a real labor market", *Experimental Economics*, Vol. 4 No. 3, pp. 399-425.
26
27 Huang, M. H., and Rust, R. T. (2018), "Artificial intelligence in service", *Journal of Service*
28 *Research*, Vol. 21, No. 2, pp. 155-172.
29
30 Ivanov, S., Gretzel, U., Berezina, K., Sigala, M., and Webster, C. (2019), Progress on robotics in
31 hospitality and tourism: a review of the literature. *Journal of Hospitality and Tourism*
32 *Technology*, Vol. 10 No. 4, pp. 489-521.
33
34 Kees, J., Berry, C., Burton, S., and Sheehan, K. (2017), "An Analysis of Data Quality: Professional
35 Panels, Student Subject Pools, and Amazon's Mechanical Turk", *Journal of Advertising*, Vol.
36 46 No. 1, pp. 141-155.
37
38 Kim, S., and McGill, A. L. (2011), "Gaming with Mr. Slot or gaming the slot machine? Power,
39 anthropomorphism, and risk perception", *Journal of Consumer Research*, Vol. 38 No. 1, pp.
40 94-107.
41
42 Kim, T., Jiang, L., Lee, H., and Duhachek, A. (2019), "Telling Your Secrets to an Ai: Consumers
43 Prefer Disclosing Private Personal Information to an Ai (Vs. a Human)", *ACR North*
44 *American Advances*.
45
46 Kinateder, M., Müller, M., Jost, M., Mühlberger, A., and Pauli, P. (2014), "Social influence in a
47 virtual tunnel fire—influence of conflicting information on evacuation behavior", *Applied*
48 *ergonomics*, Vol. 45 No. 6, pp. 1649-1659.
49
50 Kunz, W. H., Heinonen, K., and Lemmink, J. G. (2019), "Future service technologies: is service
51 research on track with business reality?", *Journal of Services Marketing*, Vol. 33 No. 4, pp.
52 479-487.
53
54 Marinova, D., de Ruyter, K., Huang, M. H., Meuter, M. L., and Challagalla, G. (2017), "Getting
55 smart: Learning from technology-empowered frontline interactions", *Journal of Service*
56 *Research*, Vol. 20 No. 1, pp. 29-42.
57
58 Mende, M., Scott, M. L., van Doorn, J., Grewal, D., and Shanks, I. (2019), "Service robots rising:
59 How humanoid robots influence service experiences and elicit compensatory consumer
60 responses," *Journal of Marketing Research*, Vol. 56 No. 4, pp. 535-556.
61
62 Mettler, T., Sprenger, M., and Winter, R. (2017), "Service robots in hospitals: new perspectives on
63 niche evolution and technology affordances", *European Journal of Information Systems*, Vol.
64 26 No. 5, pp. 451-468.

- 1
2
3 Miller, C. J., Samper, A., Mandel, N., Brannon, D. C., Salas, J., and Troncoza, M. (2021). "Activity
4 apprehension in experiential purchases", *Journal of Services Marketing*, Vol. 35 No. 4, pp.
5 516-534.
6
7 MontyCafe (2021), "Monty Robo Cafe", available at <https://montycafe.com/>
8 Mortimer, G., and Dootson, P. (2017), "The economics of self-service checkouts", *The Conversation*,
9 *June 12*.
10 Mortimer, G., and Dootson, P. (2020), "Watch yourself: the self-surveillance strategy to keep
11 supermarket shoppers honest", *The Conversation*, *June 15*.
12 National Health and Medical Research Council. (2018), "National Statement on Ethical Conduct in
13 Human Research 2007(Updated 2018)", available at
14 www.nhmrc.gov.au/guidelines/publications/e72
15
16 Nomura, T., Kanda, T., and Suzuki, T. (2006), "Experimental investigation into influence of negative
17 attitudes toward robots on human-robot interaction", *AI and Society*, Vol. 20 No. 2, pp. 138-
18 150.
19
20 Palermo, A. (2022), "Starship Food Delivery Robots Land on Campus", available at
21 [https://dnews.com/local/starship-food-delivery-robots-land-on-campus/article_4c8c9378-](https://dnews.com/local/starship-food-delivery-robots-land-on-campus/article_4c8c9378-cfae-5168-931c-9c7bc93688d7.html)
22 [cfae-5168-931c-9c7bc93688d7.html](https://dnews.com/local/starship-food-delivery-robots-land-on-campus/article_4c8c9378-cfae-5168-931c-9c7bc93688d7.html)
23
24 Parasuraman, R., and Riley, V. (1997), "Humans and automation: Use, misuse, disuse,
25 abuse", *Human Factors*, Vol. 39 No. 2, pp. 230-253.
26
27 Park, J., Kim, D., and Hyun, H. (2021). "Understanding self-service technology adoption by "older"
28 consumers", *Journal of Services Marketing*, Vol. 35 No. 1, pp. 78-97.
29
30 Piçarra, N., and Giger, J. C. (2018), "Predicting intention to work with social robots at anticipation
31 stage: Assessing the role of behavioral desire and anticipated emotions", *Computers in*
32 *Human Behavior*, Vol. 86, pp. 129-146.
33
34 Pratt, T. C., Cullen, F. T., Sellers, C. S., Winfree Jnr, T. L., Madensen, T. D., Daigle, L. E., Fearn, N.
35 E., Gau, J. M. (2010), "The Empirical Status of Social Learning Theory: A Meta-Analysis",
36 *Justice Quarterly*, Vol. 27 No. 6, pp. 765-802.
37
38 Quantum Robotics (2021), "Amy is an intelligent service robot", available at
39 <https://www.quantumrobotics.com.au/amy/>
40
41 R4 Robotics (2022), "Pepper | The sociable humanoid robot by SoftBank Robotics", available
42 at: [https://r4robotics.com.au/collections/humanoid-and-social-robots/products/pepper-the-](https://r4robotics.com.au/collections/humanoid-and-social-robots/products/pepper-the-socially-aware-humanoid-robot-by-softbank-robotics)
43 [socially-aware-humanoid-robot-by-softbank-robotics](https://r4robotics.com.au/collections/humanoid-and-social-robots/products/pepper-the-socially-aware-humanoid-robot-by-softbank-robotics)
44
45 Robinson G. (2011), "Self-service checkouts: Are bad apple scan cheats going bananas?", available at
46 [http://www.smh.com.au/lifestyle/shopping/selfservice-checkouts-are-bad-apple-scan-cheats-](http://www.smh.com.au/lifestyle/shopping/selfservice-checkouts-are-bad-apple-scan-cheats-going-bananas-20110803-1iauq.html)
47 [going-bananas-20110803-1iauq.html](http://www.smh.com.au/lifestyle/shopping/selfservice-checkouts-are-bad-apple-scan-cheats-going-bananas-20110803-1iauq.html)
48
49 Roesler, E., Manzey, D., and Onnasch, L. (2021), "A meta-analysis on the effectiveness of
50 anthropomorphism in human-robot interaction", *Science Robotics*, Vol. 6 No. 58, pp. 1-10.
51
52 Rosenbaum, M. S., and Massiah, C. (2011), "An expanded servicescape perspective", *Journal of*
53 *Service Management*. Vol. 22 No. 4, pp. 471-490.
54
55 Rosenbaum, M. S., and Montoya, D. Y. (2007), "Am I welcome here? Exploring how ethnic
56 consumers assess their place identity", *Journal of Business Research*, Vol. 60 No. 3, pp. 206-
57 214.
58
59 Schepers, J., and Streukens, S. (2022), "To serve and protect: a typology of service robots and their
60 role in physically safe services", *Journal of Service Management*, preprint.
61
62 Sheehan, B., Jin, H.S. and Gottlieb, U., 2020. "Customer service chatbots: Anthropomorphism and
63 adoption", *Journal of Business Research*, Vol. 115, pp.14-24.

- 1
2
3 Siguaw, J. A., Mai, E., and Wagner, J. A. (2019), "Expanding servicescape dimensions with safety:
4 An exploratory study", *Services Marketing Quarterly*, Vol. 40 No. 2, pp. 123-140.
- 5 Simalis L. (2012), "Shady shoppers stealing millions using scanner tricks at Coles and Woolworths
6 self-serve checkouts", available at [http://www.news.com.au/finance/money/shady-shoppers-](http://www.news.com.au/finance/money/shady-shoppers-stealing-millions-using-scanner-tricks/story-e6frfmd9-1226514344385)
7 [stealing-millions-using-scanner-tricks/story-e6frfmd9-1226514344385](http://www.news.com.au/finance/money/shady-shoppers-stealing-millions-using-scanner-tricks/story-e6frfmd9-1226514344385)
8
- 9 Silva, J. H., Mendes, G. H., Miguel, P. A. C., Amorim, M., and Teixeira, J. G. (2021), "Customer
10 experience research: intellectual structure and future research opportunities", *Journal of*
11 *Service Theory and Practice*. Vol. 31 No. 6, pp. 893-931.
- 12 Sisman, B., and Kucuk, S. (2019), "An Educational Robotics Course: Examination of Educational
13 Potentials and Pre-Service Teachers' Experiences", *International Journal of Research in*
14 *Education and Science*, Vol. 5 No. 2, pp. 510-531.
- 15 Söderlund, M. (2021), "The robot-to-robot service encounter: an examination of the impact of inter-
16 robot warmth", *Journal of Services Marketing*, Vol. 35 No. 9, pp. 15-27.
- 17 Tam, K. P., Lee, S. L., and Chao, M. M. (2013), "Saving Mr. Nature: Anthropomorphism enhances
18 connectedness to and protectiveness toward nature", *Journal of Experimental Social*
19 *Psychology*, Vol. 49 No. 3, pp. 514-521.
- 20 Taylor, E. (2016), "Supermarket self-checkouts and retail theft: The curious case of the SWIPERS",
21 *Criminology and Criminal Justice*, Vol. 16 No. 5, pp. 552-567.
- 22 Van Doorn, J., Mende, M., Noble, S. M., Hulland, J., Ostrom, A. L., Grewal, D., and Petersen, J. A.
23 (2017), "Domo arigato Mr. Roboto: Emergence of automated social presence in
24 organizational frontlines and customers' service experiences", *Journal of Service*
25 *Research*, Vol. 20 No. 1, pp. 43-58.
- 26 Wirtz, J. and Zeithaml, V. (2018), "Cost-effective service excellence", *Journal of the Academy of*
27 *Marketing Science*, Vol. 46 No. 1, pp. 59-80.
- 28 Wirtz, J., P.G. Patterson, W.H. Kunz, T. Gruber, V.N. Lu, S. Paluch and A. Martins, (2018), "Brave
29 New World: Service Robots in the Frontline", *Journal of Service Management*, Vol. 29 No. 5,
30 pp. 907-931
- 31 World Economic Forum (2020), *The Future of Jobs Report 2020 (October)*, Centre for the New
32 Economy and Society.
- 33 Yang, L. W., Aggarwal, P., and McGill, A. L. (2020), "The 3 C's of anthropomorphism: Connection,
34 comprehension, and competition", *Consumer Psychology Review*, Vol. 3 No. 1, pp. 3-19.
- 35 Zikmund, W., Ward, S., Lowe, B., Winzar, H., and Babin, B. J. (2011), *Marketing research* (2nd Asia
36 Pacific ed.). Victoria: Cengage Learning.
- 37
38
39
40
41
42
43
44
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47
48
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TABLE I. Means, standard deviations, and correlations of the main study variables

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Humanness	3.17	1.82	--				
2. Empathy	3.79	1.51	0.35**	--			
3. Risk	3.34	1.61	0.31**	0.33**	--		
4. NARs	3.97	1.12	0.09*	0.11**	0.20**	--	
5. Theft intentions	5.05	1.77	-0.26**	-0.32**	-0.27**	0.04	--

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed).