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Robotic transformative service research: deploying social robots for consumer well-being during COVID-19 and beyond

Social robots
for consumer
well-being

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Abstract

Purpose – Besides the direct physical health consequences, through social isolation COVID-19 affects a considerably larger share of consumers with deleterious effects for their psychological well-being. Two vulnerable consumer groups are particularly affected: older adults and children. The purpose of the underlying paper is to take a transformative research perspective on how social robots can be deployed for advancing the well-being of these vulnerable consumers and to spur robotic transformative service research (RTSR).

Design/methodology/approach – This paper follows a conceptual approach that integrates findings from various domains: service research, social robotics, social psychology and medicine.

Findings – Two key findings advanced in this paper are (1) a typology of robotic transformative service (i.e. entertainer, social enabler, mentor and friend) as a function of consumers' state of social isolation, well-being focus and robot capabilities and (2) a future research agenda for RTSR.

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Practical implications – This paper guides service consumers and providers and robot developers in identifying and developing the most appropriate social robot type for advancing the well-being of vulnerable consumers in social isolation.

Originality/value – This study is the first to integrate social robotics and transformative service research by developing a typology of social robots as a guiding framework for assessing the status quo of transformative robotic service on the basis of which it advances a future research agenda for RTSR. It further complements the underdeveloped body of service research with a focus on eudaimonic consumer well-being.

Keywords Social robots, Vulnerable consumers, COVID-19, Eudaimonic well-being, Robotic transformative service research

Paper type Conceptual paper

COVID-19 acts as a major disruptive factor for service consumers. The concerted world-wide quarantine measures that impose on consumers to live in social isolation have immediate and long-term detrimental psychological health consequences (Brooks *et al.*, 2020). These negative effects are exacerbated for vulnerable consumer groups, particularly older adults and children (Holmes *et al.*, 2020). Even with easing of the COVID-19 measures, a significant share of vulnerable consumers likely continues to live under restricted social contact and suffers from durable negative psychological health outcomes (e.g. older adults who represent a high-risk group; World Health Organization, 2020a).

A promising avenue to counter the adverse consequences of social isolation for vulnerable consumers is provided by the field of social robotics (e.g. de Graaf *et al.*, 2015). Social robots are physically embodied agents designed for assisting and engaging in social interactions with humans in their everyday lives (Fong *et al.*, 2003). An example is Pepper [1], a social robot that can interact with humans through conversation and its touch screen. Social robots can provide service to consumers without human interaction and may, thus, be deployed to create uplifting changes for consumer well-being during COVID-19 and beyond.

Even though the past decade of service research has witnessed the foundation and surge of how service can transform the well-being of consumers (Anderson, 2010; Anderson *et al.*, 2013; Anderson and Ostrom, 2015; Gustafsson *et al.*, 2015), alongside an increasing accentuation of the role of robots in service (Čaić *et al.*, 2018; Mende *et al.*, 2019; van Doorn *et al.*, 2017; Wirtz *et al.*, 2018), a systematic integration of social robots and transformative service research (TSR) is still in a nascent stage. As a consequence, the question of how social robots might assist vulnerable consumers to attenuate, or even reverse the negative psychological health consequences of social isolation and advance well-being, remains unaddressed.

The underlying paper draws from the fields of social robotics (e.g. de Graaf *et al.*, 2015), medicine (e.g. Hawkey; Cacioppo, 2010), social psychology (Ryan and Deci, 2001) and service research (e.g. Anderson *et al.*, 2013) to derive interdisciplinary insights into how social robot service may improve vulnerable consumer well-being when facing social isolation. In doing so, it aims to contribute to service theory and practice by advancing a social robot perspective of TSR: *robotic TSR (RTSR)*, which we define as the integration of social robot and transformative service research that focuses on well-being-relevant outcomes of consumer and employee interactions with social robots. First, this study synthesizes findings from social robotics based on a typology of robotic transformative service to derive an understanding of the status quo and future potential of transforming vulnerable consumer well-being in social isolation. Second, it extends this synthesis and identifies a future research agenda for the newly identified sub-area of *RTSR*.

COVID-19 and social isolation

Extended periods of social distancing and isolation can seriously deteriorate the psychological well-being of individuals (Brooks *et al.*, 2020). The consequences of the

worldwide measures to combat COVID-19 force consumers into a deficiency of social contact or *objective* social isolation (Hawkey and Cacioppo, 2010; Steptoe *et al.*, 2013). Though few individuals may lead solitary lives without feeling lonely, generally recent evidence documents a significant predictive effect of social disconnectedness on *subjective* social isolation (Santini *et al.*, 2020). The latter is equated with loneliness or the distress concerning the quality or quantity of one's social relationships.

In particular, this subjective state of social isolation is associated with severe negative implications for physical, psychological and cognitive health (Hawkey and Cacioppo, 2010). Various longitudinal studies suggest subjective social isolation as a risk factor for physical health deterioration and mortality (e.g. Cacioppo *et al.*, 2002; Holt-Lunstad *et al.*, 2015; Steptoe *et al.*, 2013). Further, it is associated with increased moodiness and depression (Cacioppo *et al.*, 2006), faster cognitive decline and an intensified sensitivity to social threats (Bassuk *et al.*, 1999; Cacioppo and Hawkey, 2009). Subjective social isolation is most prevalent among children and older adults (Pinquart and Sorensen, 2001), making them a particularly vulnerable consumer group during COVID-19.

Vulnerable consumer needs and well-being

Consumer vulnerability can be described as “a state in which consumers are subject to harm because their access to and control over resources are restricted in ways that significantly inhibit their ability to function in the marketplace” (Hill and Sharma, 2020, p. 1). Thus, this paper focuses on those consumers who are especially prone to suffer mental health consequences during COVID-19; non-adolescent children before puberty and people of 65 years of age and older (Holmes *et al.*, 2020), which will be simply referred to as children and older adults in the remainder of the paper (Kabadayi *et al.*, 2020). Depending on their degree of agency and autonomy, these groups may, particularly, struggle with accessing services that can help them overcome suffering through resource losses (e.g. Henkel *et al.*, 2017); hence, they both deserve specific attention from service research and offer ample potential for service to positively transform their well-being (Anderson *et al.*, 2013). Accordingly, the World Health Organization (2020b) emphasized the potential repercussions of COVID-19 measures on the mental health of exactly these two vulnerable groups and advocated their guidance.

Research on well-being is broadly approached from one of two perspectives: hedonic and eudaimonic (Ryan and Deci, 2001). Hedonic well-being is equated with pleasure and happiness and often operationalized as satisfaction and positive affect or the absence thereof (Diener, 2012; Diener and Lucas, 1999). The eudaimonic form defines well-being along a set of dimensions that promote meaning and self-realization (e.g. environmental mastery, personal growth and positive social relations; Ryff, 1989) to advocate fully functioning individuals (Rogers, 1963). Integrating both approaches, the underlying study explores the potential of service to promote the well-being of vulnerable consumers. Depending on the circumstances they are facing, vulnerable consumers may benefit most from services with an emphasis on hedonic (e.g. entertainment) or eudaimonic (e.g. life-coaching) well-being in order for them to overcome the negative consequences of social isolation and thrive in the marketplace. Yet, particularly eudaimonic consumer needs may become significantly more pronounced during periods of crises (Barnes *et al.*, 2020). The next section discusses one particularly promising angle of how service can achieve this goal by deploying social robots.

The transformative potential of social robots

As a consequence of COVID-19, human service delivery became potentially harmful or in its extremes even lethal to both service providers and consumers (Miriri, 2020). Hence, a particularly promising avenue for service research to support vulnerable consumers during COVID-19 and beyond lies in social robot service. Social robots may increase consumers'

access to and control over resources and decrease their vulnerability without violating physical distancing or isolation in their pursuit of well-being (Henkel *et al.*, 2017; Hill and Sharma, 2020). Indeed, findings from social robotics in the context of vulnerable consumers report various ways for social robots to promote well-being. For instance, robots that promote social connectedness (e.g. telepresence robots and socially assistive robots) may decrease objective and subjective social isolation for vulnerable consumers including older adults (e.g. Robinson *et al.*, 2014) and children (e.g. Moerman *et al.*, 2019).

Prior research shows that social robots can function as emotional and social actors (Čaić *et al.*, 2019; de Graaf *et al.*, 2015) with a clear transformative mission. They demonstrate social behavior, following the norms of human social interaction (e.g. touch and emotional reactions; Wang and Rau, 2019). With these abilities, social robots create social presence and are perceived as social agents (van Doorn *et al.*, 2017), particularly by children (Kahn *et al.*, 2012) and older adults (Heerink *et al.*, 2009). There is ample evidence in the field of social robotics that vulnerable consumers in social isolation not only promote hedonic (e.g. cheering up) but also eudaimonic well-being. For instance, robots may stimulate environmental mastery and personal growth through advancing communication skills and learning experiences (Baxter *et al.*, 2017; Crompton *et al.*, 2018; Khaksar *et al.*, 2019). They may also help to form positive social relationships, such as assuming roles in socialization, companionship, developing emotional relationships, comforting, coping with stress, anxiety and other negative emotional experiences and supporting ties with other people (Cañamero and Lewis, 2016; Crossman *et al.*, 2018; D'onofrio *et al.*, 2019; Khaksar *et al.*, 2016; Melson *et al.*, 2009).

Robotic transformative potential in times of COVID-19 and beyond – a typology

This section synthesizes findings in the social robotics literature that are relevant for the well-being of vulnerable consumers facing social isolation. Structuring the status quo and the required future roles of transformative robotic service along three dimensions resulted in four distinct types of robotic transformative service. As depicted in Figure 1, the types are a function of (1) the predominant state of social isolation (i.e. objective vs. subjective), (2) the desired or required well-being emphasis (i.e. hedonic vs. eudaimonic) and (3) robot physical and psychosocial capabilities. As theorized here, the transformative potential of social robots is dependent on future technological advancements, particularly for those consumers who encounter severe subjective social isolation and who require structural support to attain eudaimonic well-being goals. Importantly, the different types resemble the authors'

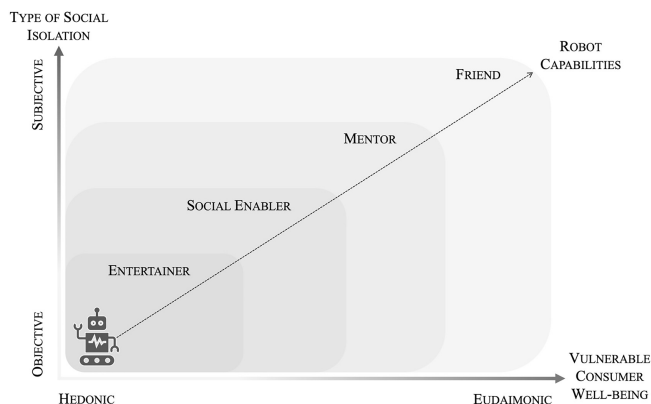


Figure 1.
A typology of robotic transformative service to counter social isolation

interpretation of respective findings in the literature, and they do not imply a corresponding construal from an emic perspective.

To date, robots with empathetic artificial intelligence (AI) (Huang and Rust, 2018) and human-level physical capabilities (Adalgeirsson and Breazeal, 2010; He *et al.*, 2017) are not yet market ready. However, exactly these types of social robots could provide complex transformative service, based on physical touch, social expressiveness and relationship building (Huang and Rust, 2018). Below, we delineate in detail the transformative potential of each robot type for vulnerable consumers in social isolation, starting with those already being deployed to provide transformative service (i.e. entertainer and social enabler), and concluding with the types that are subject to current (i.e. mentor) and future (i.e. friend) research and development.

Market-ready robotic transformative service roles

Entertainer. The entertainer robot might be most suitable to serve consumers who face imposed social disconnectedness and, hence, merely experience minor psychological discomfort (e.g. boredom). The entertainer's social capabilities are limited since this robot type is preprogrammed to perform simple and repetitive social tasks. The entertainer may also be less equipped to console consumers through its touch due to its confined physical dexterity and basic embodiment. Its main transformative potential is hedonically oriented and lies in amusing consumers to increase their momentary affect as an end in itself (e.g. enjoyment when playing a game; Leite *et al.*, 2008; dissipation in states of momentary solitude; Odekerken-Schröder *et al.*, in press). It might be deployed to prevent both older adults and children from experiencing minor psychological discomfort during isolation periods (Heljakka and Ihämäki, 2020). An example is Alibaba's DWI Dowellin, a small robot on wheels which entertains users by singing and dancing (Alibaba, 2020).

Social enabler. As a social enabler, the robot may unfold its transformative potential by mediating social interactions for vulnerable consumers. The social enabler robot is not yet imbued with empathetic intelligence; however, with its improved physical capabilities (i.e. physical touch and mirroring social gestures) it can resemble authentic social contact (Rosenthal-von der Pütten *et al.*, 2018). For instance, it can simultaneously display social contacts on screen and simulate their gestures and expressions through its artificial limbs (Adalgeirsson and Breazeal, 2010). During social isolation, this robot type may enable children to continue interacting with their peers and tutors and connect older adults with family, friends, and healthcare service providers from a distance. It might, thus, help socially isolated vulnerable consumers form and maintain positive social relations, and thereby improve academic performance (Furrer and Skinner, 2003) and affective well-being (Schmidt *et al.*, 2019) for children and diminish the negative effects of social isolation on physical (Cornwell and Waite, 2009) and mental (McInnis and White, 2001) health for older adults. Hence, the social enabler bears the potential to transform aspects of both hedonic and eudaimonic consumer well-being. An example is the MeBot, a small robot with two controllable arms and a big display that shows the interaction partner's face (Adalgeirsson and Breazeal, 2010).

Future-oriented robotic transformative service roles

Mentor. Assuming a mentor role, transformative robotic service is predominantly directed at supporting vulnerable consumers in overcoming threats to their pursuit of eudaimonic well-being. During social isolation, both children and older adults are deprived of transformative, self-actualizing services which usually require the presence of a professional service provider (e.g. education, physio- and psycho-therapy). A mentor robot type may autonomously engage consumers on a professional, social and empathetic level while exhibiting nearly human-level physical capabilities (e.g. navigation, touch and object manipulation). With such capabilities,

mentor robots could embody school teachers and hobby instructors (Niemiec and Ryan, 2009) or physiotherapists (Bhuvanewari *et al.*, 2013).

Recent findings document that social educational robots can increase consumers' productivity, language skills and physical, cognitive and social-emotional learning experiences (Baxter *et al.*, 2017; Crompton *et al.*, 2018; Khaksar *et al.*, 2019). Likewise, regular physical activity with mentor type robots has been shown to ensure older adults' mobility (Bhuvanewari *et al.*, 2013; Lopez Recio *et al.*, 2013) prolonging their ability to live independently. Although vulnerable consumers may experience hedonic pleasure during these interactions (Čaić *et al.*, 2019), mentor robots may particularly promote long-term eudaimonic well-being outcomes for children and older adults alike. While such robots are used in research, no fully autonomous version that integrates all mentor-type capabilities exists in the marketplace yet that could substitute a human service provider (Čaić *et al.*, 2019). In the future, an example robot for children and older consumers could be physically advanced versions of ICP's Keeko (Low, 2018) or Pal Robotics' GrowMu (Georgiadis *et al.*, 2016), respectively. Both robots combine human-like facial features with verbal communication abilities.

Friend. As a friend, the robot unfolds its transformative potential for vulnerable consumers who experience psychological distress (e.g. loneliness and lack of relatedness) due to both objective and subjective social isolation (Brooks *et al.*, 2020). A friend robot may mitigate these negative consequences through quasi-social interactions. As envisioned here, this type of transformative robotic service would require an empathetic intelligence for rapport building and human-level haptic behaviors (e.g. touching and hugging) to provide solace through physical touch (Tanaka *et al.*, 2007). As a friend, the robot could help alleviate the negative effects of social isolation by providing both hedonic and eudaimonic well-being in the form of genuine care and emotional comfort (Lehoux and Grimard, 2018), personalized service (Robinson *et al.*, 2014; Sorell and Draper, 2014) and rebuilding self-esteem (Leite *et al.*, 2012). Initial evidence suggests that children and older adults may perceive prototypes of such autonomous robots as social beings (Kahn *et al.*, 2012) and friends (Cañamero and Lewis, 2016; Sinoo *et al.*, 2018). While robots assuming a mentor role may predominantly provide eudaimonically oriented professional transformative service, as genuine, loving companions, friend type robots could cater to the entirety of well-being aspects (Crossman *et al.*, 2018; Kachouie *et al.*, 2014). In the future, such a robot might be a significantly advanced version of Pepper, equipped with an empathetic AI.

Discussion and future research agenda

Vulnerable consumers routinely face adverse circumstances in the marketplace. With the advent of COVID-19, increased social distancing has raised the hurdles to participate in the marketplace for all consumers, and it has exacerbated the social isolation of vulnerable consumers in particular. This study advances a typology of transformative robotic service that integrates work on social isolation (e.g. Hawkey; Cacioppo, 2010), well-being (Ryan and Deci, 2001) and social robotics (e.g. de Graaf *et al.*, 2015) with the aim to cater to the underrepresented group for vulnerable consumers in service research (Rosenbaum *et al.*, 2017).

The typology is derived based on two of the most affected vulnerable consumer groups during COVID-19: children and older adults (Holmes *et al.*, 2020; World Health Organization, 2020a), and its main objective is to guide service researchers, practitioners and consumers on the potential of robotic service to offset the negative consequences of social isolation (Brooks *et al.*, 2020) now and in the future. Figure 2 provides an overview of the conceptual integration of the robot typology into the transformation of hedonic and eudaimonic well-being of vulnerable consumers in the (post) COVID-19 reality. With an increasing level of

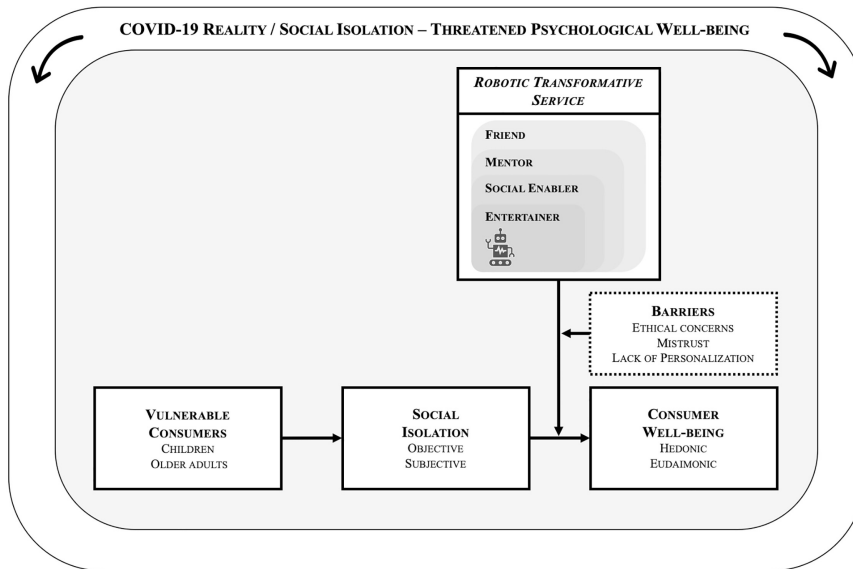


Figure 2.
Robotic
transformative service
infusion during social
isolation

sophistication of capabilities, social robots are already equipped to provide transformative service as entertainers and social enablers and in the foreseeable future also as mentors. However, the full spectrum of eudaimonic well-being will likely only be provided by a friend-type robot which does not yet exist in the marketplace. We therefore encourage social robot research and development to focus on designing such a service with the aim to better support vulnerable consumers with a comprehensive focus on eudaimonic well-being.

The theoretical integration of social robot service and well-being suggests a novel, interdisciplinary perspective on the role of service in creating uplifting changes for consumers (Anderson, 2010; Anderson *et al.*, 2013; Anderson and Ostrom, 2015; Gustafsson *et al.*, 2015). Traditionally, a majority of service research has documented predominantly ephemeral, positive (e.g. Oliver *et al.*, 1997) or negative *hedonic* effects on consumer affect (e.g. Bougie *et al.*, 2003) – mostly as an unintended consequence of service. This study offers an integrative well-being perspective to service and thereby also supplements research on the eudaimonic well-being of consumers (e.g. Guo *et al.*, 2013; Henkel *et al.*, 2017). Through identifying context-dependent (i.e. state of social isolation/well-being emphasis) transformative roles of social robots, the underlying paper identifies a new sub-area for TSR: *robotic transformative service research (RTSR)*.

In accord with the literature review in the field of social robotics on the various roles that transformative robotic service can assume in enhancing the well-being of vulnerable consumers, Table 1 advances an illustrative compilation of future research avenues for RTSR. The agenda is organized along three main topics: (1) the transformative potential of social robots as entertainers, social enablers, mentors and friends, (2) barriers to robotic transformative service potential and (3) eudaimonic consumer well-being. In two additional columns, the table condenses the existing knowledge on each respective topic with exemplary research findings and outlines concrete future research avenues for RTSR. These questions are grouped in themes ranging from robot to service design, over consumer perceptions, ethical considerations and the assessment of robot-facilitated well-being. Rather than providing an exhaustive overview, Table 1 is meant as a catalyst to stimulate research on RTSR.

Table 1.
Status quo and future
research agenda on
RTSR in times of
COVID-19 and beyond

Topic	What we know	Future research agenda
Transformative potential of social robots as		
(1) Entertainer	Robot roles	Service context
(2) Social enabler	(1) Current state of knowledge indicates that users and caregivers consider that robots should not aim to replace humans but could only perform certain tasks (Lehoux and Grimard, 2018).	(1) What context-related factors play a role in robotic transformative service?
(3) Mentor	(2) Social robots can take complementary roles (e.g. motivational coach) and assist human caregivers in improving older adults' physical and psychosocial well-being (Caić et al., 2019)	(2) What well-being-relevant service provider roles can be substituted vs. augmented by social robots?
(4) Friend	(3) Children can develop friendly relationships with robots as teachers and progressively treat them as peers or see them as friends (Cañamero and Lewis, 2016) rather than toys (Kanda et al., 2007)	Robot design
	Robot skills	(1) How does the morphology of social robots (i.e. human-like, animal-like and machine-like) impact their transformative potential for diverse groups of vulnerable consumers (e.g. children, older adults, chronically ill and bedridden patients)?
	(1) Evidence suggests that in various child-related contexts, social robots can be as successful as humans in terms of comforting (Meyns et al., 2019; Shahid et al., 2014).	(2) Which robot design aspects (e.g. appearance, tone of voice and gaze) lead to optimal well-being outcomes?
	(2) One size does not fit; all-specific attention should be paid to the development of the robot's social behavior and skills beyond a mere functional support for the person (Bedat et al., 2019)	Robot social capabilities
	(3) Social robots can provide personalized services (Robnson et al., 2014; Sorell and Draper, 2014), emotional comfort (Lehoux and Grimard, 2018) and can help rebuild self-esteem (Leite et al., 2012)	(1) What is the impact of automated social presence on the transformative potential of robots?
Fulfillment of psychosocial needs		(2) Can the fulfillment of psychological needs serves as an explanatory mechanism of how social robots unfold their transformative potential?
		(3) Can social robots be equally successful in building positive social relations for adults as they are for children?
		Consumer attitudes
		(1) There is strong empirical evidence in various service contexts that documents negative attitudes of consumers toward automation (e.g. Longoni et al., 2019) and robots in particular (Wang et al., 2015).
		(2) What role do these attitudes play in transformative robotic service interactions?

(continued)

Topic	What we know	Future research agenda
	<p>(1) Social robots can strengthen older adults' sense of autonomy by making them less dependent to staff and formal care, closer to friends and families outside the facilitations and more functionally available in doing tasks (Pirhonen <i>et al.</i>, 2020).</p> <p>(2) Social robots have potential to reduce older adults' social vulnerability (Khaksar <i>et al.</i>, 2016)</p>	<p>(3) What is the effect of COVID-19 on consumer attitudes toward social robots and have these attitudes reversed in the new "1.5m-society"? Consumer acceptance</p> <p>(1) What drives the acceptance of different social robot roles among vulnerable consumers (i.e. individual level) and their care networks (i.e. collective level)?</p> <p>(2) Which haptic behaviors (e.g. touching and hugging) are deemed appropriate by vulnerable consumers? How can such behaviors be leveraged for increased consumer acceptance?</p>
Barriers to robotic transformative potential	<p>Dehumanization and loss of privacy</p> <p>(1) Older adults fear social robots would substitute their nursing staff and even further increase their loneliness (Cai <i>et al.</i>, 2018).</p> <p>(2) Ethical considerations include loss of human contact, increased feeling of objectification and loss of control, loss of privacy and personal freedom as well as deception and infantilization (Sharkey and Sharkey, 2012)</p> <p>(3) Contextual factors of privacy, trust and perceived behavioral control have a negative impact on continued use of social robots (de Graaf <i>et al.</i>, 2015)</p> <p>Need for personalization</p> <p>(1) Personalization is critical to emotional exchanges with robots (Henkemans <i>et al.</i>, 2017; Kim <i>et al.</i>, 2013).</p> <p>(2) Sandygulova and O'Hare, 2018 found that gender matching is important for robot preference. Children choose social robots with the same gender</p>	<p>Ethical concerns</p> <p>(1) To what extent <i>can</i> and <i>should</i> robots take responsibility over children and/or older adults as care givers?</p> <p>(2) To what extent is deception an alarming ethical concern? Can we identify the robot design and behavior characteristics that lead to consumer deception?</p> <p>(3) Research suggests that sometimes meaningful professional relationships or even (commercial) friendships might emerge from service interactions (e.g. Price and Amould, 1999; Yim <i>et al.</i>, 2008). Can the robot-as-friend type assume a similar role? And if yes, is it desirable and ethically tolerable to deploy social robots as human substitutes for consumers with low agency?</p> <p>(4) Can one robot type (e.g. friend) cater to all consumer needs at once, or is the most effective transformative robotic service context dependent?</p> <p>Mistrust</p> <p>(1) What are the robot design barriers that make robots less trustworthy and humane than real humans in child and older adults care?</p>

(continued)

Table 1.

Topic	What we know	Future research agenda
Eudaimonic well-being	<p>(3) Social robots' success in decreasing older adults' social vulnerability depends on social robot enablement and mediation. Social robot enablement includes older consumers' trust in social robots, their perceptions about the costs related to social robots and their concerns about safety. Social robot mediation includes personalized service, delivery, entertainment and connectivity provided by social robots (Khaksar <i>et al.</i>, 2016)</p>	<p>(2) How do different robot morphologies affect consumer trust? (3) How will robots be equipped with truly empathetic AI being perceived and adopted? And how can we mitigate the effects of the Uncanny Valley (Mori, 1970)? Lack of personalization (1) What are the preferred gender options for different robot types (e.g. mentor vs. friend)? Or should the gender be matched with the gender of a vulnerable consumer? Other</p>
Eudaimonic well-being	<p>Psychosocial health</p> <p>(1) Social robots increase children's positive mood after stressful tasks (Crossman <i>et al.</i>, 2018). (2) Social robots strengthen children's motivations and positive emotions in therapy (Meyns <i>et al.</i>, 2019) (3) In a healthcare context, children smile more and cry less in company of a social robot (Beran <i>et al.</i>, 2015) (4) Social robots improve children's openness and mood in hospitals, contributing to their self-management (Looije <i>et al.</i>, 2016)</p> <p>Personal growth</p> <p>(1) In children-related contexts, several studies show that social robots increase productivity, learning and success of children in doing daily tasks (Baxter <i>et al.</i>, 2017; Khaksar <i>et al.</i>, 2019; Wu <i>et al.</i>, 2015).</p>	<p>(1) What are other unintended consequences of robotic transformative service on different groups of vulnerable consumers (e.g. children, older adults, chronically ill and bedridden patients)? Measuring well-being (1) How can well-being be measured for different vulnerability groups? And which, if any, new metrics need to be considered? (2) What are the long-term effects of robotic transformative service on well-being outcomes? (3) Will longitudinal studies support the claims of improved psychological well-being of vulnerable groups when compared to those without social robots during extended periods of social isolation? (4) Can positive robotic well-being implications for older adults and children be generalized to other vulnerable consumers? Well-being trade-offs (1) How can positive outcomes of interactions with social robots (e.g. eudaimonic well-being) outweigh negative consequences (e.g. privacy issues and dehumanization) for vulnerable consumers during COVID-19 and beyond?</p>

(continued)

Topic	What we know	Future research agenda
	<p>(2) Playing educational games, social robots support children's social and cognitive development (Tanaka <i>et al.</i>, 2007)</p> <p>(3) Social robots instructing older adults in physical tasks and cognitive exercises improve their physical and mental health (Bhuvaneshwari <i>et al.</i>, 2013; Lopez Recio <i>et al.</i>, 2013), prolonging older adults' ability to live independently</p>	<p>(2) Under what circumstances is deploying social robots in vulnerable consumer settings detrimental to consumer well-being? For instance, may there be conditions (e.g. absolute isolation) under which robots might reinforce consumer subjective loneliness? Different dimensions of well-being</p> <p>(1) To what extent are the hedonic and eudaimonic perspectives on well-being reconcilable in robotic transformative service?</p> <p>(2) What consumer idiosyncrasies are important to consider for an effective robotic transformation of consumer well-being?</p>

Table 1.

The COVID-19 crisis offers a futuristic perspective on the changing role of service. While many services are provided remotely, some are suspended entirely (e.g. Hall *et al.*, in press). For those services that service consumers and providers are still able and required to cocreate physically, social distance is the first priority (cf. Bove and Benoit, in press). It is conceivable that consumers may continue to hold an increased sensitivity toward social interactions with service providers that outlasts COVID-19 (cf. Hazée and van Vaerenbergh, 2020), which may in turn also affect employee well-being (Tuzovic and Kabadayi, in press). Eventually, these developments may surge service innovation (cf. Heinonen and Strandvik, in press). A rapid adoption of automated service may be a consequence. While the underlying paper advances a typology of such robotic service to cater to the well-being of vulnerable consumers facing the abyss of the consequences of social isolation, in the future, transformative robotic service may be considered for creating uplifting changes in well-being for consumers at large.

Note

1. <https://www.softbankrobotics.com/emea/en/pepper>

References

- Adalgeirsson, S.O. and Breazeal, C. (2010), "MeBot: a robotic platform for socially embodied telepresence", *2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, presented at the 2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI), IEEE, Osaka, Japan, pp. 15-22, doi: [10.1109/HRI.2010.5453272](https://doi.org/10.1109/HRI.2010.5453272).
- Alibaba (2020), "DWI Dowellin Neue Ankunft kleine mini lustige Linie Follower Roboter für Kinder", available at: <https://german.alibaba.com/product-detail/dwi-dowellin-new-arrival-small-mini-funny-line-follower-robot-for-kids-62054131383.html> (accessed 6 May 2020).
- Anderson, L. and Ostrom, A.L. (2015), "Transformative service research: advancing our knowledge about service and well-being", *Journal of Service Research*, Vol. 18 No. 3, pp. 243-249, doi: [10.1177/1094670515591316](https://doi.org/10.1177/1094670515591316).
- Anderson, L., Ostrom, A.L., Corus, C., Fisk, R.P., Gallan, A.S., Giraldo, M., Mende, M., Mulder, M., Rayburn, S.W., Rosenbaum, M.S., Shirahada, K. and Williams, J.D. (2013), "Transformative service research: an agenda for the future", *Journal of Business Research*, Vol. 66 No. 8, pp. 1203-1210, doi: [10.1016/j.jbusres.2012.08.013](https://doi.org/10.1016/j.jbusres.2012.08.013).
- Anderson, L. (2010), "Improving well-being through transformative service", in Ostrom, A.L., Bitner, M.J., Brown, S.W., Burkhard, K.A., Goul, M., Smith-Daniels, V., Demirkan, H. and Rabinovich, E. (Eds), *Moving Forward And Making A Difference: Research Priorities For The Science Of Service*, *Journal of Service Research*, Vol. 13 No. 1, pp. 4-36, doi: [10.1177/1094670509357611](https://doi.org/10.1177/1094670509357611).
- Barnes, D.C., Mesmer-Magnus, J., Scribner, L., Krallman, A. and Guidice, R. (2020), "Customer delight during a crisis: understanding delight through the lens of transformative service research", *Journal of Service Management*.
- Bassuk, S.S., Glass, T.A. and Berkman, L.F. (1999), "Social disengagement and incident cognitive decline in community-dwelling elderly persons", *Annals of Internal Medicine*, Vol. 131 No. 3, pp. 165-173, doi: [10.7326/0003-4819-131-3-199908030-00002](https://doi.org/10.7326/0003-4819-131-3-199908030-00002).
- Baxter, P., Ashurst, E., Read, R., Kennedy, J. and Belpaeme, T. (2017), "Robot education peers in a situated primary school study: personalisation promotes child learning", *PloS One*, Vol. 12 No. 5, p. e0178126, doi: [10.1371/journal.pone.0178126](https://doi.org/10.1371/journal.pone.0178126).
- Bedaf, S., Marti, P. and De Witte, L. (2019), "What are the preferred characteristics of a service robot for the elderly? a multi-country focus group study with older adults and caregivers", *Assistive Technology*, Vol. 31 No. 3, pp. 147-157, doi: [10.1080/10400435.2017.1402390](https://doi.org/10.1080/10400435.2017.1402390).
- Beran, T.N., Ramirez-Serrano, A., Vanderkooi, O.G. and Kuhn, S. (2015), "Humanoid robotics in health care: an exploration of children's and parents' emotional reactions", *Journal of Health Psychology*, Vol. 20 No. 7, pp. 984-989, doi: [10.1177/1359105313504794](https://doi.org/10.1177/1359105313504794).

- Bhuvaneshwari, P.T.V., Vignesh, S., Papitha, S. and Dharmarajan, R.S. (2013), "Humanoid robot based physiotherapeutic assistive trainer for elderly health care", *2013 International Conference on Recent Trends in Information Technology (ICRTIT)*, presented at the 2013 Third International Conference on Recent Trends in Information Technology (ICRTIT), Chennai, India, IEEE, pp. 163-168, doi: [10.1109/ICRTIT.2013.6844199](https://doi.org/10.1109/ICRTIT.2013.6844199).
- Bougie, R., Pieters, R. and Zeelenberg, M. (2003), "Angry customers don't come back, they get back: the experience and behavioral implications of anger and dissatisfaction in services", *Journal of the Academy of Marketing Science*, Vol. 31 No. 4, pp. 377-393, doi: [10.1177/0092070303254412](https://doi.org/10.1177/0092070303254412).
- Bove, L. and Benoit, S. (in press), "Restrict, clean and protect: signalling consumer safety during the pandemic and beyond", *Journal of Service Management*.
- Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N. and Rubin, G.J. (2020), "The psychological impact of quarantine and how to reduce it: rapid review of the evidence", *The Lancet*, Vol. 395 No. 10227, pp. 912-920, doi: [10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8).
- Cacioppo, J.T. and Hawkey, L.C. (2009), "Perceived social isolation and cognition", *Trends in Cognitive Sciences*, Vol. 13 No. 10, pp. 447-454, doi: [10.1016/j.tics.2009.06.005](https://doi.org/10.1016/j.tics.2009.06.005).
- Cacioppo, J.T., Hawkey, L.C., Crawford, L.E., Ernst, J.M., Burleson, M.H., Kowalewski, R.B., Malarkey, W.B., William, B., Van Cauter, E. and Bernston, G.G. (2002), "Loneliness and health: potential mechanisms", *Psychosomatic Medicine*, Vol. 64 No. 3, pp. 407-417, doi: [10.1097/00006842-200205000-00005](https://doi.org/10.1097/00006842-200205000-00005).
- Cacioppo, J.T., Hughes, M.E., Waite, L.J., Hawkey, L.C. and Thisted, R.A. (2006), "Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses", *Psychology and Aging*, Vol. 21 No. 1, pp. 140-151, doi: [10.1037/0882-7974.21.1.140](https://doi.org/10.1037/0882-7974.21.1.140).
- Čaić, M., Odekerken-Schröder, G. and Mahr, D. (2018), "Service robots: value co-creation and co-destruction in elderly care networks", *Journal of Service Management*, Vol. 29 No. 2, pp. 178-205, doi: [10.1108/JOSM-07-2017-0179](https://doi.org/10.1108/JOSM-07-2017-0179).
- Čaić, M., Avelino, J., Mahr, D., Odekerken-Schröder, G. and Bernardino, A. (2019), "Robotic versus human coaches for active aging: an automated social presence perspective", *International Journal of Social Robotics*, doi: [10.1007/s12369-018-0507-2](https://doi.org/10.1007/s12369-018-0507-2).
- Cañamero, L. and Lewis, M. (2016), "Making new 'New AI' friends: designing a social robot for diabetic children from an embodied AI perspective", *International Journal of Social Robotics*, Vol. 8 No. 4, pp. 523-537, doi: [10.1007/s12369-016-0364-9](https://doi.org/10.1007/s12369-016-0364-9).
- Cornwell, E.Y. and Waite, L.J. (2009), "Social disconnectedness, perceived isolation, and health among older adults", *Journal of Health and Social Behavior*, Vol. 50 No. 1, pp. 31-48, doi: [10.1177/002214650905000103](https://doi.org/10.1177/002214650905000103).
- Crompton, H., Gregory, K. and Burke, D. (2018), "Humanoid robots supporting children's learning in an early childhood setting: humanoid robots supporting children's learning", *British Journal of Educational Technology*, Vol. 49 No. 5, pp. 911-927, doi: [10.1111/bjet.12654](https://doi.org/10.1111/bjet.12654).
- Crossman, M.K., Kazdin, A.E. and Kitt, E.R. (2018), "The influence of a socially assistive robot on mood, anxiety, and arousal in children", *Professional Psychology: Research and Practice*, Vol. 49 No. 1, pp. 48-56, doi: [10.1037/pro0000177](https://doi.org/10.1037/pro0000177).
- D'Onofrio, G., Fiorini, L., Hoshino, H., Matsumori, A., Okabe, Y., Tsukamoto, M., Limosani, R., Vitanza, A., Greco, F., Greco, A., Giuliani, F., Cavallo, F. and Sancarlo, D. (2019), "Assistive robots for socialization in elderly people: results pertaining to the needs of the users", *Aging Clinical and Experimental Research*, Vol. 31 No. 9, pp. 1313-1329, doi: [10.1007/s40520-018-1073-z](https://doi.org/10.1007/s40520-018-1073-z).
- de Graaf, M.M.A., Allouch, S.B. and Klamer, T. (2015), "Sharing a life with Harvey: exploring the acceptance of and relationship-building with a social robot", *Computers in Human Behavior*, Vol. 43, pp. 1-14, doi: [10.1016/j.chb.2014.10.030](https://doi.org/10.1016/j.chb.2014.10.030).
- Diener, E. and Lucas, R.E. (1999), "Personality and subjective wellbeing", in Kahneman, D., Diener, E. and Schwartz, N. (Eds), *Wellbeing: The Foundations of Hedonic Psychology*, Russell Sage Foundation, New York, pp. 213-229.

- Diener, E. (2012), "New findings and future directions for subjective well-being research", *American Psychologist*, Vol. 67 No. 8, pp. 590-597, doi: [10.1037/a0029541](https://doi.org/10.1037/a0029541).
- Fong, T., Nourbakhsh, I. and Dautenhahn, K. (2003), "A survey of socially interactive robots", *Robotics and Autonomous Systems*, Vol. 42 Nos 3-4, pp. 143-166, doi: [10.1016/S0921-8890\(02\)00372-X](https://doi.org/10.1016/S0921-8890(02)00372-X).
- Furrer, C. and Skinner, E. (2003), "Sense of relatedness as a factor in children's academic engagement and performance", *Journal of Educational Psychology*, Vol. 95 No. 1, pp. 148-162, doi: [10.1037/0022-0663.95.1.148](https://doi.org/10.1037/0022-0663.95.1.148).
- Georgiadis, D., Christophorou, C., Kleanthous, S., Andreou, P., Santos, L., Christodoulou, E. and Samaras, G. (2016), "A robotic cloud ecosystem for elderly care and ageing well: the GrowMeUp approach", in Kyriacou, E., Christofides, S. and Pattichis, C.S. (Eds), *XIV Mediterranean Conference on Medical and Biological Engineering and Computing 2016*, Springer International Publishing, Cham, Vol. 57, pp. 919-924, doi: [10.1007/978-3-319-32703-7_179](https://doi.org/10.1007/978-3-319-32703-7_179).
- Guo, L., Arnould, E.J., Gruen, T.W. and Tang, C. (2013), "Socializing to co-produce: pathways to consumers' financial well-being", *Journal of Service Research*, Vol. 16 No. 4, pp. 549-563, doi: [10.1177/1094670513483904](https://doi.org/10.1177/1094670513483904).
- Gustafsson, A., Aksoy, L., Brady, M.K., McColl-Kennedy, J.R., Sirianni, N.J., Witell, L. and Wuenderlich, N.V. (2015), "Conducting service research that matters", *Journal of Services Marketing*, Vol. 29 Nos 6/7, pp. 425-429, doi: [10.1108/JSM-02-2015-0103](https://doi.org/10.1108/JSM-02-2015-0103).
- Hall, C.M., Prayag, G., Fieger, P. and Dyason, D. (in press), "Beyond panic buying: consumption displacement and COVID-19", *Journal of Service Management*.
- Hawkey, L.C. and Cacioppo, J.T. (2010), "Loneliness matters: a theoretical and empirical review of consequences and mechanisms", *Annals of Behavioral Medicine*, Vol. 40 No. 2, pp. 218-227, doi: [10.1007/s12160-010-9210-8](https://doi.org/10.1007/s12160-010-9210-8).
- Hazée, S. and Van Vaerenbergh, Y. (2020), "Customers' contamination concerns: an integrative framework and future prospects for service management", *Journal of Service Management*.
- He, W., Li, Z. and Chen, C.P. (2017), "A survey of human-centered intelligent robots: issues and challenges", *IEEE/CAA Journal of Automatica Sinica*, Vol. 4 No. 4, pp. 602-609, doi: [10.1109/JAS.2017.7510604](https://doi.org/10.1109/JAS.2017.7510604).
- Heerink, M., Kröse, B., Evers, V. and Wielinga, B. (2009), "Influence of social presence on acceptance of an assistive social robot and screen agent by elderly users", *Advanced Robotics*, Vol. 23 No. 14, pp. 1909-1923, doi: [10.1163/016918609X12518783330289](https://doi.org/10.1163/016918609X12518783330289).
- Heinonen, K. and Strandvik, T. (in press), "Reframing service innovation: COVID-19 as catalyst for imposed service innovation", *Journal of Service Management*.
- Heljakka, K. and Ihämäki, P. (2020), in Arai, K., Bhatia, R. and Kapoor, S. (Eds), "Toys that mobilize: past, present and future of phygital playful technology", *Proceedings of the Future Technologies Conference (FTC) 2019*, Springer International Publishing, Cham, Vol. 1070, pp. 625-640, doi: [10.1007/978-3-030-32523-7_46](https://doi.org/10.1007/978-3-030-32523-7_46).
- Henkel, A.P., Boegershausen, J., Ciuchita, R. and Odekerken-Schröder, G. (2017), "Storm after the quiet: how marketplace interactions shape consumer resources in collective goal pursuits", *Journal of the Association for Consumer Research*, Vol. 2 No. 1, pp. 26-47, doi: [10.1086/690463](https://doi.org/10.1086/690463).
- Henkemans, O.A.B., Bierman, B.P.B., Janssen, J., Looije, R., Neerincx, M.A., van Dooren, M.M.M., de Vries, J.L.E., van der Burg, G.J. and Huisman, S.D. (2017), "Design and evaluation of a personal robot playing a self-management education game with children with diabetes type 1", *International Journal of Human-Computer Studies*, Vol. 106, pp. 63-76, doi: [10.1016/j.ijhcs.2017.06.001](https://doi.org/10.1016/j.ijhcs.2017.06.001).
- Hill, R.P. and Sharma, E. (2020), "Consumer vulnerability", *Journal of Consumer Psychology*, Vol. 30 No. 3, pp. 551-570, doi: [10.1002/jcpy.1161](https://doi.org/10.1002/jcpy.1161).
- Holmes, E.A., O'Connor, R.C., Perry, V.H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christense, H., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A.K., Shafran, R., Sweeney, A., Worthman, C.M., Yardley, L., Cowan, K., Cope, C.,

- Hotopf, M. and Bullmore, E. (2020), "Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science", *The Lancet Psychiatry*, Vol. 7 No. 6, pp. 547-560, doi: [10.1016/S2215-0366\(20\)30168-1](https://doi.org/10.1016/S2215-0366(20)30168-1).
- Holt-Lunstad, J., Smith, T.B., Baker, M., Harris, T. and Stephenson, D. (2015), "Loneliness and social isolation as risk factors for mortality: a meta-analytic review", *Perspectives on Psychological Science*, Vol. 10 No. 2, pp. 227-237, doi: [10.1177/1745691614568352](https://doi.org/10.1177/1745691614568352).
- Huang, M.-H. and Rust, R.T. (2018), "Artificial intelligence in service", *Journal of Service Research*, Vol. 21 No. 2, pp. 155-172, doi: [10.1177/1094670517752459](https://doi.org/10.1177/1094670517752459).
- Kabadayi, S., Hu, K., Lee, Y., Hanks, L., Walsman, M. and Dobrzykowski, D. (2020), "Fostering older adult care experiences to maximize well-being outcomes: a conceptual framework", *Journal of Service Management*, doi: [10.1108/JOSM-11-2019-0346](https://doi.org/10.1108/JOSM-11-2019-0346).
- Kachouie, R., Sedighadel, S., Khosla, R. and Chu, M.-T. (2014), "Socially assistive robots in elderly care: a mixed-method systematic literature review", *International Journal of Human-Computer Interaction*, Vol. 30 No. 5, pp. 369-393, doi: [10.1080/10447318.2013.873278](https://doi.org/10.1080/10447318.2013.873278).
- Kahn, P.H., Kanda, T., Ishiguro, H., Freier, N.G., Severson, R.L., Gill, B.T., Ruckert, J.H. and Shen, S. (2012), "'Robovie, you'll have to go into the closet now': children's social and moral relationships with a humanoid robot", *Developmental Psychology*, Vol. 48 No. 2, pp. 303-314, doi: [10.1037/a0027033](https://doi.org/10.1037/a0027033).
- Kanda, T., Sato, R., Saiwaki, N. and Ishiguro, H. (2007), "A two-month field trial in an elementary school for long-term human-robot interaction", *IEEE Transactions on Robotics*, Vol. 23 No. 5, pp. 962-971, doi: [10.1109/TRO.2007.904904](https://doi.org/10.1109/TRO.2007.904904).
- Khaksar, S.M.S., Khosla, R., Chu, M.T. and Shahmehar, F.S. (2016), "Service innovation using social robot to reduce social vulnerability among older people in residential care facilities", *Technological Forecasting and Social Change*, Vol. 113 B, pp. 438-453, doi: [10.1016/j.techfore.2016.07.009](https://doi.org/10.1016/j.techfore.2016.07.009).
- Khaksar, S.M.S., Khosla, R., Singaraju, S. and Slade, B. (2019), "Carer's perception on social assistive technology acceptance and adoption: moderating effects of perceived risks", *Behaviour and Information Technology*, doi: [10.1080/0144929X.2019.1690046](https://doi.org/10.1080/0144929X.2019.1690046).
- Kim, Y., Kwak, S.S. and Kim, M. (2013), "Am I acceptable to you? effect of a robot's verbal language forms on people's social distance from robots", *Computers in Human Behavior*, Vol. 29 No. 3, pp. 1091-1101, doi: [10.1016/j.chb.2012.10.001](https://doi.org/10.1016/j.chb.2012.10.001).
- Lehoux, P. and Grimard, D. (2018), "When robots care: public deliberations on how technology and humans may support independent living for older adults", *Social Science and Medicine*, Vol. 211, pp. 330-337, doi: [10.1016/j.socscimed.2018.06.038](https://doi.org/10.1016/j.socscimed.2018.06.038).
- Leite, I., Pereira, A., Martinho, C. and Paiva, A. (2008), "Are emotional robots more fun to play with?", *RO-MAN 2008-The 17th IEEE International Symposium on Robot and Human Interactive Communication*, Munich, Germany, IEEE, pp. 77-82, doi: [10.1109/ROMAN.2008.4600646](https://doi.org/10.1109/ROMAN.2008.4600646).
- Leite, I., Castellano, G., Pereira, A., Martinho, C. and Paiva, A. (2012), "Long-term interactions with empathic robots: evaluating perceived support in children", in Ge, S.S., Khatib, O., Cabibihan, J.-J., Simmons, R. and Williams, M.-A. (Eds), *Social Robotics, ICSR 2012, Lecture Notes in Computer Science*, Springer Berlin Heidelberg, Berlin, Heidelberg, Vol. 7621, pp. 298-307, doi: [10.1007/978-3-642-34103-8_30](https://doi.org/10.1007/978-3-642-34103-8_30).
- Longoni, C., Bonezzi, A. and Morewedge, C.K. (2019), "Resistance to medical artificial intelligence", *Journal of Consumer Research*, Vol. 46 No. 4, pp. 629-650, doi: [10.1093/jcr/ucz013](https://doi.org/10.1093/jcr/ucz013).
- Looije, R., Neerincx, M.A., Peters, J.K. and Henkemans, O.A.B. (2016), "Integrating robot support functions into varied activities at returning hospital visits: supporting child's self-management of diabetes", *International Journal of Social Robotics*, Vol. 8 No. 4, pp. 483-497, doi: [10.1007/s12369-016-0365-8](https://doi.org/10.1007/s12369-016-0365-8).
- Lopez Recio, D., Marquez Segura, L., Marquez Segura, E. and Waern, A. (2013), "The NAO models for the elderly", *2013 8th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*,

presented at the 2013 8th ACM/IEEE International Conference on Human-Robot Interaction (HRI), Tokyo, Japan, IEEE, pp. 187-188, doi: [10.1109/HRI.2013.6483564](https://doi.org/10.1109/HRI.2013.6483564).

- Low, A. (2018), "China is using adorable robot teachers in kindergartens", cnet, available at: <https://www.cnet.com/news/china-is-using-adorable-robot-teachers-in-kindergartens/> (accessed 5 May 2020).
- McInnis, G.J. and White, J.H. (2001), "A phenomenological exploration of loneliness in the older adult", *Archives of Psychiatric Nursing*, Vol. 15 No. 3, pp. 128-139, doi: [10.1053/apnu.2001.23751](https://doi.org/10.1053/apnu.2001.23751).
- Melson, G.F., Kahn, P.H., Beck, A., Friedman, B., Roberts, T., Garrett, E. and Gill, B.T. (2009), "Children's behavior toward and understanding of robotic and living dogs", *Journal of Applied Developmental Psychology*, Vol. 30 No. 2, pp. 92-102, doi: [10.1016/j.appdev.2008.10.011](https://doi.org/10.1016/j.appdev.2008.10.011).
- Mende, M., Scott, M.L., van Doorn, J., Grewal, D. and Shanks, I. (2019), "Service robots rising: how humanoid robots influence service experiences and elicit compensatory consumer responses", *Journal of Marketing Research*, Vol. 56 No. 4, pp. 535-556, doi: [10.1177/0022243718822827](https://doi.org/10.1177/0022243718822827).
- Meyns, P., van der Spank, J., Capiou, H., De Cock, L., Van Steirteghem, E., Van der Loooven, R. and Van Waelvelde, H. (2019), "Do a humanoid robot and music increase the motivation to perform physical activity? a quasi-experimental cohort in typical developing children and preliminary findings in hospitalized children in neutropenia", *International Journal of Human-Computer Studies*, Vol. 122, pp. 90-102, doi: [10.1016/j.ijhcs.2018.07.010](https://doi.org/10.1016/j.ijhcs.2018.07.010).
- Miriri, D. (2020), "Rwandan medical workers deploy robots to minimise coronavirus risk", available at: <https://www.weforum.org/agenda/2020/06/rwandan-medical-workers-robots-coronavirus-covid19-risk?fbclid=IwAR1cPR31ubsCXoxufPjtStf63BpEDfRmGDpSwWnvhd87yGAluVtYj0s8M> (accessed 6 June 2020).
- Moerman, C.J., van der Heide, L. and Heerink, M. (2019), "Social robots to support children's well-being under medical treatment: a systematic state-of-the-art review", *Journal of Child Health Care*, Vol. 23 No. 4, pp. 596-612, doi: [10.1177/1367493518803031](https://doi.org/10.1177/1367493518803031).
- Mori, M. (1970), "The uncanny valley", *Energy*, Vol. 7 No. 4, pp. 33-35, (in Japanese). A translation that was authorized and reviewed by Mori was published in Mori, M., MacDorman, K.F. and Kageki, N. (2012), "The uncanny valley", *IEEE Robotics and Automation Magazine*, Vol. 19 No. 2, pp. 98-100, doi: [10.1109/MRA.2012.2192811](https://doi.org/10.1109/MRA.2012.2192811).
- Niemiec, C.P. and Ryan, R.M. (2009), "Autonomy, competence, and relatedness in the classroom: applying self-determination theory to educational practice", *Theory and Research in Education*, Vol. 7 No. 2, pp. 133-144, doi: [10.1177/1477878509104318](https://doi.org/10.1177/1477878509104318).
- Odekerken-Schröder, G., Mele, C., Russo Spena, T., Mahr, D. and Ruggiero, A. (in press), "Mitigating loneliness with companion robots in the COVID-19 pandemic and beyond: an integrative framework and research agenda", *Journal of Service Management*.
- Oliver, R., Rust, R.T. and Varki, S. (1997), "Customer delight: foundations, findings, and managerial insight", *Journal of Retailing*, Vol. 73 No. 3, pp. 311-336, doi: [10.1016/S0022-4359\(97\)90021-X](https://doi.org/10.1016/S0022-4359(97)90021-X).
- Pinquart, M. and Sorensen, S. (2001), "Influences on loneliness in older adults: a meta-analysis", *Basic and Applied Social Psychology*, Vol. 23 No. 4, pp. 245-266, doi: [10.1207/S15324834BASP2304_2](https://doi.org/10.1207/S15324834BASP2304_2).
- Pirhonen, J., Melkas, H., Laitinen, A. and Pekkarinen, S. (2020), "Could robots strengthen the sense of autonomy of older people residing in assisted living facilities?—a future-oriented study", *Ethics and Information Technology*, Vol. 22, pp. 151-162, doi: [10.1007/s10676-019-09524-z](https://doi.org/10.1007/s10676-019-09524-z).
- Price, L.L. and Arnould, E.J. (1999), "Commercial friendships: service provider–client relationships in context", *Journal of Marketing*, Vol. 63 No. 4, pp. 38-56, doi: [10.1177/002224299906300405](https://doi.org/10.1177/002224299906300405).
- Robinson, H., MacDonald, B. and Broadbent, E. (2014), "The role of healthcare robots for older people at home: a review", *International Journal of Social Robotics*, Vol. 6 No. 4, pp. 575-591, doi: [10.1007/s12369-014-0242-2](https://doi.org/10.1007/s12369-014-0242-2).
- Rogers, C.R. (1963), "The actualizing tendency in relation to 'motives' and to consciousness", in *Nebraska Symposium on Motivation*, University of Nebraska Press, Lincoln, NE, Jones, M.R. (Ed.), Vol. 11, pp. 1-24.

- Rosenbaum, M.S., Seger-Guttman, T. and Giraldo, M. (2017), "Commentary: vulnerable consumers in service settings", *Journal of Services Marketing*, Vol. 31 Nos 4/5, pp. 309-312, doi: [10.1108/JSM-05-2017-0156](https://doi.org/10.1108/JSM-05-2017-0156).
- Rosenthal-von der Pütten, A.M., Krämer, N.C. and Herrmann, J. (2018), "The effects of humanlike and robot-specific affective nonverbal behavior on perception, emotion, and behavior", *International Journal of Social Robotics*, Vol. 10 No. 5, pp. 569-582, doi: [10.1007/s12369-018-0466-7](https://doi.org/10.1007/s12369-018-0466-7).
- Ryan, R.M. and Deci, E.L. (2001), "On happiness and human potentials: a review of research on hedonic and eudaimonic well-being", *Annual Review of Psychology*, Vol. 52 No. 1, pp. 141-166, doi: [10.1146/annurev.psych.52.1.141](https://doi.org/10.1146/annurev.psych.52.1.141).
- Ryff, C.D. (1989), "Happiness is everything, or is it? explorations on the meaning of psychological well-being", *Journal of Personality and Social Psychology*, Vol. 57 No. 6, pp. 1069-1081, doi: [10.1037/0022-3514.57.6.1069](https://doi.org/10.1037/0022-3514.57.6.1069).
- Sandygulova, A. and O'Hare, G.M.P. (2018), "Age-and gender-based differences in children's interactions with a gender-matching robot", *International Journal of Social Robotics*, Vol. 10 No. 5, pp. 687-700, doi: [10.1007/s12369-018-0472-9](https://doi.org/10.1007/s12369-018-0472-9).
- Santini, Z.I., Jose, P.E., York Cornwell, E., Koyanagi, A., Nielsen, L., Hinrichsen, C., Meilstrup, C., Madsen, K.R. and Koushede, V. (2020), "Social disconnectedness, perceived isolation, and symptoms of depression and anxiety among older Americans (NSHAP): a longitudinal mediation analysis", *The Lancet Public Health*, Vol. 5 No. 1, pp. e62-e70, doi: [10.1016/S2468-2667\(19\)30230-0](https://doi.org/10.1016/S2468-2667(19)30230-0).
- Schmidt, A., Dirk, J. and Schmiedek, F. (2019), "The importance of peer relatedness at school for affective well-being in children: between-and within-person associations", *Social Development*, Vol. 28 No. 4, pp. 873-892, doi: [10.1111/sode.12379](https://doi.org/10.1111/sode.12379).
- Shahid, S., Krahmer, E. and Swerts, M. (2014), "Child-robot interaction across cultures: how does playing a game with a social robot compare to playing a game alone or with a friend?", *Computers in Human Behavior*, Vol. 40, pp. 86-100, doi: [10.1016/j.chb.2014.07.043](https://doi.org/10.1016/j.chb.2014.07.043).
- Sharkey, A. and Sharkey, N. (2012), "Granny and the robots: ethical issues in robot care for the elderly", *Ethics and Information Technology*, Vol. 14 No. 1, pp. 27-40, doi: [10.1007/s10676-010-9234-6](https://doi.org/10.1007/s10676-010-9234-6).
- Sinoo, C., van der Pal, S., Blanson Henkemans, O.A., Keizer, A., Bierman, B.P.B., Looije, R. and Neerinx, M.A. (2018), "Friendship with a robot: children's perception of similarity between a robot's physical and virtual embodiment that supports diabetes self-management", *Patient Education and Counseling*, Vol. 101 No. 7, pp. 1248-1255, doi: [10.1016/j.pec.2018.02.008](https://doi.org/10.1016/j.pec.2018.02.008).
- Sorell, T. and Draper, H. (2014), "Robot carers, ethics, and older people", *Ethics and Information Technology*, Vol. 16 No. 3, pp. 183-195, doi: [10.1007/s10676-014-9344-7](https://doi.org/10.1007/s10676-014-9344-7).
- Steptoe, A., Shankar, A., Demakakos, P. and Wardle, J. (2013), "Social isolation, loneliness, and all-cause mortality in older men and women", *Proceedings of the National Academy of Sciences*, Vol. 110 No. 15, pp. 5797-5801, doi: [10.1073/pnas.1219686110](https://doi.org/10.1073/pnas.1219686110).
- Tanaka, F., Cicourel, A. and Movellan, J.R. (2007), "Socialization between toddlers and robots at an early childhood education center", *Proceedings of the National Academy of Sciences*, Vol. 104 No. 46, pp. 17954-17958, doi: [10.1073/pnas.0707769104](https://doi.org/10.1073/pnas.0707769104).
- Tuzovic, S. and Kabadayi, S. (in press), "The influence of social distancing on employee wellbeing: a conceptual framework and research agenda", *Journal of Service Management*.
- van Doorn, J., Mende, M., Noble, S.M., Hulland, J., Ostrom, A.L., Grewal, D. and Petersen, J.A. (2017), "Domo arigato Mr. Roboto: emergence of automated social presence in organizational frontlines and customers' service experiences", *Journal of Service Research*, Vol. 20 No. 1, pp. 43-58, doi: [10.1177/1094670516679272](https://doi.org/10.1177/1094670516679272).
- Wang, B. and Rau, P.-L.P. (2019), "Influence of embodiment and substrate of social robots on users' decision-making and attitude", *International Journal of Social Robotics*, Vol. 11 No. 3, pp. 411-421, doi: [10.1007/s12369-018-0510-7](https://doi.org/10.1007/s12369-018-0510-7).

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- Wang, S., Lilienfeld, S.O. and Roachat, P. (2015), "The uncanny valley: existence and explanations", *Review of General Psychology*, Vol. 19 No. 4, pp. 393-407, doi: [10.1037/gpr0000056](https://doi.org/10.1037/gpr0000056).
- Wirtz, J., Patterson, P.G., Kunz, W.H., Gruber, T., Lu, V.N., Paluch, S. and Martins, A. (2018), "Brave new world: service robots in the frontline", *Journal of Service Management*, Vol. 29 No. 5, pp. 907-931, doi: [10.1108/JOSM-04-2018-0119](https://doi.org/10.1108/JOSM-04-2018-0119).
- World Health Organization (2020a), "Coronavirus disease 2019 (COVID-19) situation report – 51", available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200311-sitrep-51-COVID-19.pdf?sfvrsn=1ba62e57_10 (accessed 06 May 2020).
- World Health Organization (2020b), "Mental health and psychological resilience during the COVID-19 pandemic", available at: <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-COVID-19/news/news/2020/3/mental-health-and-psychological-resilience-during-the-COVID-19-pandemic> (accessed 10 June 2020).
- Wu, W.-C.V., Wang, R.-J. and Chen, N.-S. (2015), "Instructional design using an in-house built teaching assistant robot to enhance elementary school English-as-a-foreign-language learning", *Interactive Learning Environments*, Vol. 23 No. 6, pp. 696-714, doi: [10.1080/10494820.2013.792844](https://doi.org/10.1080/10494820.2013.792844).
- Yim, C.K.(Bennett), Tse, D.K. and Chan, K.W. (2008), "Strengthening customer loyalty through intimacy and passion: roles of customer–firm affection and customer–staff relationships in services", *Journal of Marketing Research*, Vol. 45 No. 6, pp. 741-756, doi: [10.1509/jmkr.45.6.741](https://doi.org/10.1509/jmkr.45.6.741).

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