TAKING CARE OF TOUCHSCREEN DEVICES: Discussing consumer attachment and anthropomorphism

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CUIDANDO DE DISPOSITIVOS TOUCHSCREEN: Discutindo o apego do consumidor e o antropomorfismo

Abstract

People are often attached to their devices and take care of them differently. However, do they ever stop to think that their devices can be a means of transmitting diseases? For that matter, it is critical to comprehend that touchscreen devices are increasingly recognized as potential vehicles for disease transmission. Despite this, its hygiene needs to be addressed by consumers. This essay discusses how consumer attachment and anthropomorphism influence people's care for their touchscreen devices. Specifically, we propose that an individual with a high (vs. low) attachment to a touchscreen device tends to care less about the hygiene of this device compared to other types of care. In addition, when a touchscreen device is anthropomorphized (vs. not) by a person with a high (vs. low) attachment to this device, the person tends to care more about device hygiene. The salience of the perceived risk of disease transmission through the device explains this effect. This essay fills knowledge gaps about how touchscreen device care can be neglected compared to other types of care. Furthermore, the influence of anthropomorphism in this relationship considers contagious diseases. As managerial and social contributions, companies could develop tools that, using the device's anthropomorphism, send alerts about the need to maintain the hygiene of this device and provide information on how and at what frequency to sanitize it properly.

Keywords: Consumer attachment. Touchscreen devices. Anthropomorphism. Diseases. Contamination. Hygiene.

Resumo

As pessoas geralmente estão apegadas a seus dispositivos e cuidam deles de maneiras diferentes. No entanto, eles já pararam para pensar que seus aparelhos podem ser um meio de transmissão de doenças? Nesse sentido, é fundamental compreender que os dispositivos touchscreen são cada vez mais reconhecidos como potenciais veículos de transmissão de doenças. Apesar disso, sua higiene precisa ser abordada pelos consumidores. Este ensaio discute como o apego do consumidor e o antropomorfismo influenciam o cuidado das pessoas com seus dispositivos touchscreen. Especificamente, propomos que um indivíduo com alto (vs. baixo) apego a um dispositivo touchscreen tende a se preocupar menos com a higiene desse dispositivo em comparação com outros tipos de cuidados. Além disso, quando um dispositivo touchscreen é antropomorfizado (vs. não) por uma pessoa com alto (vs. baixo) apego a esse dispositivo, a pessoa tende a se preocupar mais com a higiene do dispositivo. A saliência do risco percebido de transmissão de doenças por meio do dispositivo explica esse efeito. Este ensaio preenche lacunas de conhecimento sobre como os cuidados com dispositivos touchscreen podem ser negligenciados em comparação com outros tipos de cuidados. Além disso, a influência do antropomorfismo nessa relação leva em consideração as doenças contagiosas. Como contribuições gerenciais e sociais, as empresas poderiam desenvolver ferramentas que, utilizando o antropomorfismo do aparelho, enviem alertas sobre a necessidade de manter a higiene desse aparelho e forneçam informações sobre como e com que frequência o higienizam adequadamente.

1 INTRODUCTION

Consider the following situations regarding your smartphone: you use it to communicate with your family and friends, access your social networks, browse the internet, play games, watch videos, listen to music, use banking apps, make online purchases, access your e-mail box, locate yourself using the GPS. Furthermore, you do not leave the house without him; he is always with or near you when you are at home. Sometimes, being away from him can even make you restless or anxious. Additionally, you take care of it in several ways: buy cases, update the software, install new apps, put on a mobile film to not damage the screen, buy support for your car or for the table/office, in addition, you acquire a selfie stick. However, do you take care of sanitizing and disinfecting your touchscreen device?

People are often attached to their devices and take care of them differently. However, do they ever stop to think that their devices can be a means of transmitting diseases? The above situations show how consumers maintain an attachment relationship with their devices (Bodford et al., 2017; Ellis, 2019; Nie et al., 2020; Parent & Shapka, 2019; Wu et al., 2017).

In this sense, the consumer's attachment to an object is "the strength of the emotional bond that a consumer experiences with a product" (Schifferstein & Zwartkruis-Pelgrim, 2008, p. 1). The consumer-object (e.g., product) relationship is the basis of consumer attachment literature. In discussions on devices, such as smartphones, the consumer's attachment lies in the proximity search, in the secure base, in the safe harbor, and the anxiety of separation concerning this device (Konok et al., 2017; Konok et al., 2016; Parent & Shapka, 2019), in social connections (Ellis, 2019), and in utilitarian aspects.

Besides, the situations presented show some of the care people take with their devices, raising the question: Do consumers care about sanitizing their devices? For that matter, it is critical to comprehend that touchscreen devices (e.g., cell phones, tablets) "are increasingly recognized as potential vehicles for disease transmission" (Jones et al., 2020, p. 147). According to Nunes (2018), although cell phones seem harmless, they are among the objects of personal use with the most potential for contaminating people.

Smartphones, the most typical representatives of this type of device and the closest to the consumer (e.g., functioning as "companions") (Carolus et al., 2019), "carry a large load of microorganisms, including pathogenic ones, and are rarely disinfected" (Spataro et al., 2018, p. 26). So, pathogens can be concentrated both on the surface and the back of the cell phone (Ramos, 2022). Despite this, Spataro et al. (2018) suggest that its hygiene needs to be addressed by consumers.

In the matter of academic discussions, the health area focuses on the importance of keeping these devices clean in healthcare environments (Bhardwaj et al., 2020; Jones et al., 2020; Moreira et al., 2022); however, in the marketing and consumer behavior field, these discussions are incipient and can be considered a gap in the literature. From this perspective, we seek to discuss several questions in this paper: What is the influence of consumer attachment in caring for their touchscreen devices? What reaction does the consumer have regarding care with the hygiene and disinfection of their devices? Would the anthropomorphization of the device change the influence of attachment in this care? Past research does not address these questions. Therefore, **this essay discusses how consumer attachment and anthropomorphism influence people's care for their touchscreen devices.**

The current paper contributes to the literature on consumer attachment, extending this investigation to touchscreen devices (Nie et al., 2020; Tandon et al., 2020; Xiaofei et al., 2020) and to the types of care that consumers prioritize or neglect regarding their devices.

Furthermore, this essay adopts the perspective of anthropomorphism of objects in contexts of contagious diseases, which is little addressed in the literature (Huang et al., 2019; Wang et al., 2019). In this way, it fills a gap in the anthropomorphism literature about this influence on consumer care with their touchscreen devices.

2 CONSUMER ATTACHMENT, TOUCHSCREEN DEVICES, AND TAKING CARE OF OBJECTS

Interpersonal attachment theorists postulate that humans are born with a behavioral attachment system (i.e., an innate psychobiological system) that motivates them to seek proximity to attachment figures (Tsai, 2014). Those figures are significant others (e.g., family members, close friends, romantic partners), and they can take the form of brands, products, objects, or possessions in the consumer attachment paradigm (Belk, 1988; Park et al., 2010; Tsai, 2014). Thus, consumers connect with specific consumption objects through attachment, creating a psychological bond with an object (Park et al., 2010). According to Schifferstein and Zwartkruis-Pelgrim (2008), the consumer's attachment is the strength of the emotional bond with a product (e.g., clothing, photographs, stuffed animals).

Past research often uses questions such as "*To what extent do you feel emotionally bonded to [object]?*" or "*To what extent do you feel that you are personally connected to [object]?*" to measure consumers' attachment to specific objects (Park et al., 2010). Attachment is anchored in the connection and affection components of the person-to-object relationship. However, it may also be related to some components, such as passion (e.g., especially when it comes to passion for brands) (Thomson et al., 2005). Irreplaceability is an essential attachment component (i.e., the strength of emotional attachment). However, an object's concept of indispensability (i.e., the strength of consumer-product functional relationships) can also play a role in consumer attachment (Schifferstein & Zwartkruis-Pelgrim, 2008).

Still, regarding attachment components, five are primarily associated with attachment to products and brands but can be extended to other objects: relationship quality created by the object; trust in the integrity of the object; aesthetic attractiveness; delight induced by contact with the object, and image congruity that the consumer perceives with the object (Tsai, 2011). In Belk's view (1988), people connect to objects because they help define and maintain the self.

In this sense, Schifferstein and Zwartkruis-Pelgrim (2008) point out four facets (Figure 01) of the self to indicate which variables affect the degree of attachment between a person and an object.

Diffuse self: seeks hedonic satisfaction, that is, the pleasure of the product through aesthetics, use, familiarity, and memories.

Private self: aims at individual fulfillment through products that help reflect a person's individuality, desires, and abilities.

Public Self: seeks the approval of others, so products symbolize a person's relationship with family, friends, or social groups.

Collective self: seeks the approval of a reference group at the collective level; thus, products symbolize an idea, a philosophy of life, or an abstract entity for a reference group.
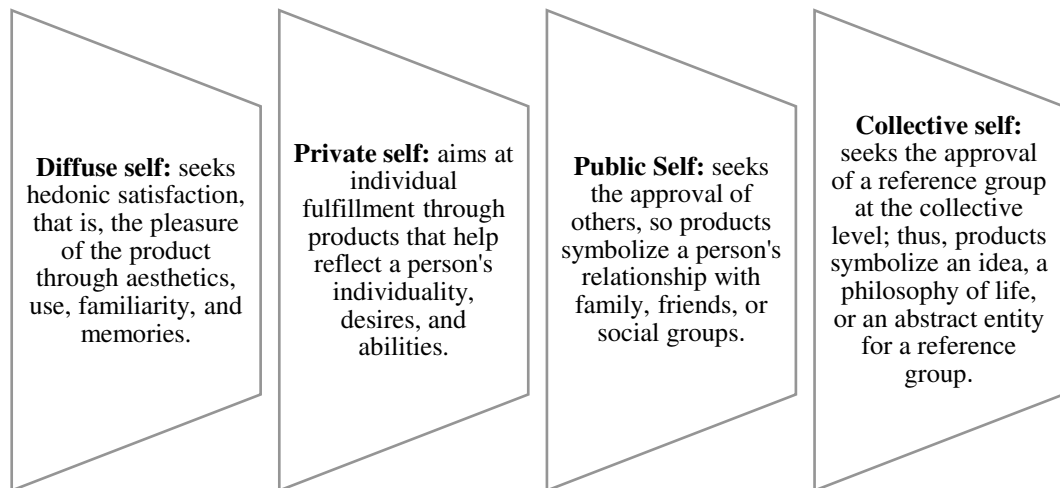
Figure 01: Self's Facets
Source: Elaborated by the authors (based on Schifferstein and Zwartkruis-Pelgrim, 2008).

Regarding consumer attachment to their touchscreen devices, previous research has focused on the damage to their health due to the use of it with a focus on smartphones; such discussions encompass difficulty sleeping (Tandon et al., 2020), fatigue, anxiety (Dhir et al., 2019; Mannion & Nolan, 2020; Nie et al.,2020), and risk of dependence (Hughes & Burke, 2018); social bonds damages due to psychological attachment and its excessive use (Lapierre & Zhao, 2021; Wolniewicz et al., 2018) or the social isolation that it can cause to physical interactions between people (Lapierre & Zhao, 2021).

In contrast, other studies show that such devices are helpful for health interventions (Chiu et al., 2016; Klasnja & Pratt, 2012; Xiaofei et al., 2020). For example, smartphone apps can motivate people's oral hygiene behavior (Underwood; Birdsall & Kay, 2015). These devices are on our side (Ward et al., 2017), being seen as companions (Carolus et al., 2019). So, it is possible to mention that they can help the individual to feel accepted by the people around them and provide social activities (Ellis, 2019). Its presence can also relax people (Melumad & Pham, 2020) since the close relationship with the smartphone builds trust (Carolus et al., 2019), relieving the device owner's stress.

Nevertheless, device separation can induce some level of stress due to attachment. Konok et al. (2017) show this phenomenon, presenting components of attachment (high vs. low) to cell phones: separation anxiety (e.g., "I get nervous/tense when I leave my cell phone at home"), secure base (e.g., "If my phone is in my hand, I feel more confident"), safe haven (e.g., "If I feel uncomfortable/tense in the company, I pick up my cell phone"), and separation insecurity (e.g., "If I am stressed, I reach for my cell phone to calm myself down").

Additionally, Parent and Shapka (2019) state that the attachment to smartphones comes from the search for maintaining proximity and agree with the previous study on how these devices become a safe place (e.g., a source of security, support, a way to escape from the problems, and relaxing its owner), promoting feelings of trust, for its users. It is relevant to highlight that the attachment target separation anxiety is present in this relationship. Hence, we propose that the consumer's attachment to their touchscreen devices is associated with several concerns with the object of attachment.

These concerns may involve the aesthetics of the device (e.g., buying a case) (Hankammer et al., 2018), maintaining or improving its functionality (e.g., updating software, installing apps) (Makov et al., 2018), security (e.g., use of protective film, antivirus installation), in addition to their hygiene (e.g., purchase or use of pocket disinfectant, tissues, decontamination solutions) (Bhardwaj et al., 2020). Specifically, we propose that high (vs. low) attachment leads people to care less about the hygiene of their devices. It happens because they tend to neglect hygiene concerns compared to other types of care. Formally our proposition:

Proposition 1: An individual with a high (vs. low) attachment to a touchscreen device tends to care less about the hygiene of this device compared to other types of care.

3 ANTHROPOMORPHIZED OBJECTS AND CONSUMER REACTIONS

Anthropomorphism involves "attributing characteristics that people intuitively perceive to be uniquely human to nonhuman agents or events" (Epley et al., 2010, p. 58). So, it is grounded in a relationship that a human establishes with a non-human entity (Airenti, 2018). We can also anthropomorphize objects that, directly or indirectly, "do" something for or "with" us (e.g., brands, robots, computers, and smartphones) (Puzakova & Aggarwal, 2018). In this sense, an anthropomorphic relationship implies that people use the similarity between

anthropomorphized objects and human beings to view and react to anthropomorphized objects (i.e., they view anthropomorphized objects through a similar human lens) (Mead & Baumeister, 2020; Yang, 2020).

In sum, anthropomorphized objects can be physical, such as cars (Landwehr et al., 2011), clothing (Hur & Kwon, 2019), fruits (Cooremans & Geuens, 2019), animals (Wang & Basso, 2019), artificial intelligence (Mueller, 2020). Moreover, they can also be abstract in the form of brands (Puzakova & Aggarwal, 2018), social causes (Ahn et al., 2014), feelings (Chen et al., 2020), entities of nature like "Mother Earth" (Liu et al., 2019), communication appeals (Agrawal et al., 2021), or diseases (Huang et al., 2019; Kim & McGill, 2011; Wang et al., 2019).

Anthropomorphism affects the individual (Chen et al., 2018) and their bond with the objects involved (Wan & Chen, 2021). In this sense, anthropomorphized objects can serve three functions for consumers: understanding (by helping understand unfamiliar situations and products), connection (by fulfilling belongingness needs), and competition (when anthropomorphized objects are perceived as adversaries or potential threats to consumers' individual goals) (Yang et al., 2020). Wan and Chen (2021) assert anthropomorphism to the needs of (i) comfort and pleasantness (e.g., comfort, pleasure, emotional security, happiness, vitality, discomfort), (ii) self-identity through the expression of the individual self, relational self (e.g., social affiliation or desired type of social relationship), and collective self (e.g., inclusion as a member of a group), (iii) self-efficacy (e.g., sense of control, power, perceived autonomy).

Therefore, consumers have several reactions to anthropomorphized objects. Subsequent positive reactions include increasing people's feelings of pleasure and preference (Landwehr; et al., 2011), consumers' psychological well-being, promoting their vitality (Chen et al., 2018), as well as mitigating the effects of social exclusion, satisfying the needs of individuals' social security (Mourey et al., 2017). Adverse reactions can also occur, although they are little explored (e.g., thinking of products as anthropomorphized makes people less willing to replace them) (Chandler & Schwarz, 2010).

In the subsequent section, we discuss the relationship between consumer attachment and anthropomorphism. Furthermore, we debate how anthropomorphism has been studied in the health field and how it can influence the relationship between consumer attachment and their touchscreen devices.

4 CONSUMER ATTACHMENT AND ANTHROPOMORPHISM

There may be similarities between consumer attachment and anthropomorphism literature, although they cannot be interpreted similarly. So, we propose that the consumer's attachment to an object does not necessarily mean that the person sees this object as anthropomorphized (that is, humanized). The main idea is that consumer attachment involves a bond/connection between an object and a person (Park et al., 2010), while anthropomorphism involves attributing human-like characteristics, properties, and mental or practical states to non-human objects (Epley et al., 2007; Waytz et al., 2010).

In addition, recent studies show a relationship between this literature that still needs further exploration. Overall, they show that object anthropomorphism (i.e., when consumers think objects are more like humans) generates more consumer attachment to these objects (Chi et al., 2023; Kim et al., 2022; Singh, 2022; Yuan & Dennis, 2019). For instance, Yuan and Dennis (2019) demonstrate that visual anthropomorphizing features increased product attachment. They conclude that anthropomorphizing how a product is displayed increases willingness to pay primarily through creating an attachment to the product.

Chi et al. (2023) bring the attachment object to the context of service robots, proposing that when consumers think that robots are more like humans (i.e., anthropomorphized), they are

more likely to have an attachment to service robots. In the same direction, Singh (2022) shows that the more consumers perceive voice-activated artificial intelligence assistants (VAIs) (such as Alexa, Siri, and Google) as anthropomorphized, the greater their emotional attachment to these VAIs.

Thus, previous research has focused on the anthropomorphism of electronic devices (Yuan & Dennis, 2019), AI speakers (Kim et al., 2022), VAIs (Singh, 2022), service robots (Chi et al., 2023) and their positive effects on the consumer's attachment to these objects. In this essay, however, the focus is on discussing how the consumer's attachment to a touchscreen device leads the person to care less about the hygiene of this device compared to other types of device care and how anthropomorphism can contribute to improving this relationship. This topic will be presented in the next section.

5 ANTHROPOMORPHISM IN HEALTH AND TOUCHSCREEN DEVICES

Consumers establish connections with anthropomorphized (humanized) objects and treat them differently from non-anthropomorphized (objectified) ones, which influences their psychological, social, and emotional bonds with these objects (Wan & Chen, 2021). Thus, an anthropomorphic approach implies that people use the similarity between anthropomorphized objects and human beings to see and react to these objects (Airenti, 2018; Mead & Baumeister, 2020). Like humans, these objects can be viewed as "warm," "competent" (Olson & Mourey, 2019), or even threatening (Yang et al., 2020).

In the health field, past studies show that individuals' anthropomorphized elements (e.g., digestive system) (Newton et al., 2017) or entities that can threaten their health (e.g., diseases) have been relevant to promote changes in consumer behavior (Kim & McGill, 2011; Huang et al., 2019; Wang et al., 2019). For example, health messages about an anthropomorphized (vs. non-anthropomorphized) digestive system reduce portion-size preferences for energy-dense foods and beverages among people who feel powerless (vs. empowered) (Newton et al., 2017). Here, anthropomorphism works as an agent of social influence, affecting people's concerns about health threats through the anthropomorphized object.

In their studies, Kim and McGill (2011) anthropomorphized skin cancer, using the perspective that people perceive that the risk of getting skin cancer is higher (vs. lower) when the risk entity (cancer) is anthropomorphized (vs. non-anthropomorphized). Furthermore, people with low power (vs. high) perceive a higher risk (vs. lower), showing that the individuals' feelings of power can moderate the effect of anthropomorphism. In addition, Huang et al. (2019) show that consumers are more willing to buy health products when pests (i.e., pathogens, germs, insects, bacteria, or worms) are anthropomorphized (vs. not anthropomorphized) in advertising. Finally, Wang et al. (2019) found that people are more motivated to protect themselves from a disease when they envision it as anthropomorphized (vs. non-anthropomorphized). It happens because they feel psychologically closer and, therefore, more vulnerable to the disease.

Previous studies demonstrate that anthropomorphic elements can increase risk perception in disease cases (Kim & McGill, 2011) and non-health contexts (Barcelos et al., 2018; Xie et al., 2020). Furthermore, they show that when the salience of uncertainty is high (vs. low), anthropomorphic appeals are more influential (persuasive) than non-anthropomorphic appeals (Velasco et al., 2020). Given this, exposure to situations with the potential for contamination related to contagious diseases increases the levels of uncertainty, lack of control, and individuals' risk perception regarding the probability of becoming ill (Galoni et al., 2020; Huang & Sengupta, 2020). In this context, touchscreen devices are known to be reserves of bacteria, viruses, and other types of microbes in environments (Bhardwaj et al., 2020; Spataro et al., 2018), increasing the risk of contamination for people (Jones et al., 2020).

Most studies show that making products more human can influence subsequent consumer reactions to these products (Wan et al., 2017), as anthropomorphized products are seen and treated differently from those seen simply as objects (Yang et al., 2020). Therefore, we propose that the anthropomorphization of the touchscreen device changes the consumer's attachment relationship with their device so that they no longer neglect their hygiene and disinfection compared to other types of care.

In sum, we argue that anthropomorphization, in this case, is marked by greater risk perceptions of the device functioning as a way of disease transmission, which leads the person to be more careful with hygiene. In this line of reasoning, people seek to protect themselves, as studies show that anthropomorphism can motivate people towards protection (Wang et al., 2019). Likewise, we expect that the anthropomorphization of the device will motivate people towards prevention behaviors. Thus, they perceive the device, with which they maintain an attachment relationship, as an object that can "contract diseases" and pose a risk to their health. In this sense, past research shows that risk perceptions are influenced by anthropomorphism (Barcelos et al., 2018; Kim & McGill, 2011; Xie et al., 2020). Formally, we proposed that:

Proposition 2: When a touchscreen device is anthropomorphized (vs. not) by a person with a high (vs. low) attachment to this device, the person tends to care more about device hygiene.

Proposition 3: The salience of the perceived risk of disease transmission through the device explains this effect.

6. FINAL REMARKS

This essay discussed how consumer attachment and anthropomorphism influence people's care for their touchscreen devices. First, we proposed that there are fundamental differences between the care people take with their touchscreen devices in terms of hygiene and disinfection when compared to other types of care associated with emotional, aesthetic, functional, and safety aspects involved in the attachment relationship they maintain with their devices. From this perspective, an individual with a high (vs. low) attachment to a touchscreen device tends to care less about the hygiene of this device, favoring other types of care.

Secondly, we discussed device anthropomorphism in the context of contagious diseases, proposing that, when a touchscreen device is anthropomorphized/humanized (vs. non-anthropomorphized) by a person who has a high (vs. low) attachment to this device, they tend to care more about the hygiene of the device. This would occur because the person sees the device as a potential risk to their health, functioning as a transmission agent for the person. Thus, it would motivate them to adopt a preventive behavior, starting to clean their device more.

This essay makes several contributions. It fills in knowledge gaps about how touchscreen device care can be neglected compared to other types of care. Furthermore, the influence of anthropomorphism in this relationship considers contagious diseases. As managerial and social contributions, companies could develop tools that, using the device's anthropomorphism, send alerts about the need to maintain the hygiene of this device and provide information on how and at what frequency to sanitize it properly. For example, technology companies can develop applications to detect the frequency of user touches on the device's screen throughout the day to trigger reminders regarding its hygiene.

Cell phone and tablet brands can also incorporate applications already embedded in the devices' operating systems. Companies can also design devices with technology that enables the use of touchscreen pens, as in the case of the Moto G "Stylus," the first Moto G with a built-in pen (Higa, 2020), or develop ways to provide recommendations on how to sanitize their

products correctly (e.g., Apple disclosed how to clean the iPhone and other branded products against the coronavirus) (Alves, 2020).

Public awareness about contamination risks from cell phones remains low (Bhardwaj et al., 2020; Ramos, 2022). Also, as a contribution, this essay proposes improving public health policies aligned with encouraging the hygiene of touchscreen devices, especially in cases of contagious diseases, such as the flu, COVID-19, and other diseases arising from bacterial or virus origins. In addition, educational campaigns for the population are essential to raise awareness of this need. In this perspective, even health professionals are included, since many do not wash their hands after using their cell phones (Graveto et al., 2018; Loyola et al., 2016; Moreira et al., 2022).

Finally, future experimental studies may test the propositions presented in this essay and other variables that may affect the relationships between the presented constructs (consumer attachment and anthropomorphism) in the context of our proposal.

REFERENCES

Agrawal, S., Khandelwal, U., & Bajpai, N. (2021). Anthropomorphism in advertising: The effect of media on audience attitude. *Journal of Marketing Communications*, *27*(8), 799-815.

Ahn, H. K., Kim, H. J., & Aggarwal, P. (2014). Helping fellow beings: Anthropomorphized social causes and the role of anticipatory guilt. *Psychological Science*, *25*(1), 224-229.

Airenti, G. (2018). The development of anthropomorphism in interaction: Intersubjectivity, imagination, and theory of mind. *Frontiers in Psychology*, *9*, 2136.

Alves, P. (2020). *Como limpar iPhone:* Apple ensina a higienizar celular contra coronavírus. TechTudo. Available at : <https://www.techtudo.com.br/noticias/2020/03/apple-libera-alcool-70percent-para-limpar-iphone-e-combater-novo-coronavirus.ghtml> Access on 24 de jun. de 2023.

Barcelos, R. H., Dantas, D. C., & Sénécal, S. (2018). Watch your tone: How a brand's tone of voice on social media influences consumer responses. *Journal of Interactive Marketing*, *41*(1), 60-80.

Belk, R. W. (1988). Possessions and the extended self. *Journal of consumer research*, *15*(2), 139-168.

Bhardwaj, N., Khatri, M., Bhardwaj, S. K., Sonne, C., Deep, A., & Kim, K. H. (2020). A review on mobile phones as bacterial reservoirs in healthcare environments and potential device decontamination approaches. *Environmental Research*, *186*, 109569.

Bodford, J. E., Kwan, V. S., & Sobota, D. S. (2017). Fatal attractions: attachment to smartphones predicts anthropomorphic beliefs and dangerous behaviors. *Cyberpsychology, Behavior, and Social Networking*, *20*(5), 320-326.

Carolus, A., Binder, J. F., Muench, R., Schmidt, C., Schneider, F., & Buglass, S. L. (2019). Smartphones as digital companions: Characterizing the relationship between users and their phones. *New Media & Society*, *21*(4), 914-938.

Chandler, J., & Schwarz, N. (2010). Use does not wear ragged the fabric of friendship: Thinking

of objects as alive makes people less willing to replace them. *Journal of Consumer Psychology*, *20*(2), 138-145.

Chen, R. P., Wan, E. W., & Levy, E. (2018). The effect of social exclusion on consumer preference for anthropomorphized brands. *Journal of Consumer Psychology*, *27*(1), 23-34.

Chen, F., Chen, R. P., & Yang, L. (2020). When Sadness Comes Alive, Will It Be Less Painful? The Effects of Anthropomorphic Thinking on Sadness Regulation and Consumption. *Journal of Consumer Psychology*, *30*(2), 277-295.

Chiu, C. J., Hu, Y. H., Lin, D. C., Chang, F. Y., Chang, C. S., & Lai, C. F. (2016). The attitudes, impact, and learning needs of older adults using apps on touchscreen mobile devices: Results from a pilot study. *Computers in Human Behavior*, *63*, 189-197.

Chi, R., Zhang, J., & Pan, M. (2023). The effect of anthropomorphic competence-warmth congruence of service robots on recommendation intention. *Current Psychology*, 1-14.

Cooremans, K., & Geuens, M. (2019). Same but different: Using anthropomorphism in the battle against food waste. *Journal of Public Policy & Marketing*, *38*(2), 232-245.

Dhir, A., Kaur, P., Chen, S., & Pallesen, S. (2019). Antecedents and consequences of social media fatigue. *International Journal of Information Management*, *48*, 193-202.

Ellis, D. A. (2019). Are smartphones really that bad? Improving the psychological measurement of technology-related behaviors. *Computers in Human Behavior*, *97*, 60-66.

Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: a three-factor theory of anthropomorphism. *Psychological review*, *114*(4), 864.

Galoni, C., Carpenter, G. S., & Rao, H. (2020). Disgusted and afraid: Consumer choices under the threat of contagious disease. *Journal of Consumer Research*, *47*(3), 373-392.

Graveto, J. M., Costa, P. J., & Santos, C. I. (2018). Cell phone usage by health personnel: preventive strategies to decrease risk of cross infection in clinical context. *Texto & Contexto-Enfermagem*, *27*.

Hankammer, S., Jiang, R., Kleer, R., & Schymanietz, M. (2018). Are modular and customizable smartphones the future, or doomed to fail? A case study on the introduction of sustainable consumer electronics. *CIRP Journal of Manufacturing Science and Technology*, *23*, 146-155.

Higa, P. (2020). *Motorola anuncia Moto G Stylus com caneta e hardware intermediário*. Tecnoblog.net. Available at: <https://tecnoblog.net/324234/motorola-lanca-moto-g-stylus-caneta-moto-g-power/> Access on 13 de feb. 2021.

Huang, W., Yang, C., & Chou, W. (2019). Get Away! The Effects of Pest Anthropomorphism on Consumer Willingness to Purchase Healthcare Products. *ACR North American Advances*, 2019, *47*, 635-636.

Huang, Y., & Sengupta, J. (2020). The influence of disease cues on preference for typical versus atypical products. *Journal of Consumer Research*, *47*(3), 393-411.

Hughes, N., & Burke, J. (2018). Sleeping with the frenemy: How restricting 'bedroom use'of smartphones impacts happiness and wellbeing. *Computers in Human Behavior*, *85*, 236-244.

Hur, H. J., & Kwon, Y. J. (2019). From Possession to Relationship-An Investigation of the Consumer-driven Anthropomorphism of Fashion Goods. *Journal of the Korean Society of Clothing and Textiles*, *43*(6), 795-807.

Jones, M., Almeida, G., Jones, S. L., & Gibson, K. E. (2020). Prevalence and control of bacteria on single-user touchscreen mobile devices. *Food Protection Trends*, *40*(3), 147-153.

Kim, J., Kang, S., & Bae, J. (2022). Human likeness and attachment effect on the perceived interactivity of AI speakers. *Journal of Business Research*, *144*, 797-804.

Kim, S., & McGill, A. L. (2011). Gaming with Mr. Slot or gaming the slot machine? Power, anthropomorphism, and risk perception. *Journal of Consumer Research*, *38*(1), 94-107.

Klasnja, P., & Pratt, W. (2012). Healthcare in the pocket: mapping the space of mobile-phone health interventions. *Journal of biomedical informatics*, *45*(1), 184-198.

Konok, V., Gigler, D., Bereczky, B. M., & Miklósi, Á. (2016). Humans' attachment to their mobile phones and its relationship with interpersonal attachment style. *Computers in Human Behavior*, *61*, 537-547.

Konok, V., Pogány, Á., & Miklósi, Á. (2017). Mobile attachment: Separation from the mobile phone induces physiological and behavioural stress and attentional bias to separation-related stimuli. *Computers in Human Behavior*, *71*, 228-239.

Landwehr, J. R., McGill, A. L., & Herrmann, A. (2011). It's got the look: The effect of friendly and aggressive "facial" expressions on product liking and sales. *Journal of marketing*, *75*(3), 132-146.

Lapierre, M. A., & Zhao, P. (2022). Smartphones and social support: Longitudinal associations between smartphone use and types of support. *Social Science Computer Review*, *40*(3), 831-843.

Liu, T., Geng, L., Ye, L., & Zhou, K. (2019). "Mother Nature" enhances connectedness to nature and pro-environmental behavior. *Journal of Environmental Psychology*, *61*, 37-45.

Loyola, S., Gutierrez, L. R., Horna, G., Petersen, K., Agapito, J., Osada, J., ... & Tamariz, J. (2016). Extended-spectrum β-lactamase–producing Enterobacteriaceae in cell phones of health care workers from Peruvian pediatric and neonatal intensive care units. *American journal of infection control*, *44*(8), 910-916.

Makov, T., Fishman, T., Chertow, M. R., & Blass, V. (2019). What affects the secondhand value of smartphones: evidence from eBay. *Journal of Industrial Ecology*, *23*(3), 549-559.

Mannion, K. H., & Nolan, S. A. (2020). The effect of smartphones on anxiety: An attachment issue or fear of missing out?. *Cogent Psychology*, *7*(1), 1869378.

Mead, N. L., & Baumeister, R. F. (2021). Do objects fuel thyself? The relationship between objects and self-regulation. *Current Opinion in Psychology*, *39*, 16-19.

Melumad, S., & Pham, M. T. (2020). The smartphone as a pacifying technology. *Journal of Consumer Research*, *47*(2), 237-255.

Moreira, B. M., Carvalho, K. L. P., Santos, D. D. S., & Pinto, L. C. (2022). Análise bacteriológica de aparelhos celulares em um serviço público de saúde em Belém, estado do Pará, Brasil. *Revista Pan-Amazônica de Saúde*, *13*, 12-12.

Mourey, J. A., Olson, J. G., & Yoon, C. (2017). Products as pals: Engaging with anthropomorphic products mitigates the effects of social exclusion. *Journal of Consumer Research*, *44*(2), 414-431.

Mueller, S. T. (2020). Cognitive anthropomorphism of AI: How humans and computers classify images. *Ergonomics in Design*, *28*(3), 12-19.

Newton, F. J., Newton, J. D., & Wong, J. (2017). This is your stomach speaking: Anthropomorphized health messages reduce portion size preferences among the powerless. *Journal of Business Research*, *75*, 229-239.

Nie, J., Wang, P., & Lei, L. (2020). Why can't we be separated from our smartphones? The vital roles of smartphone activity in smartphone separation anxiety. *Computers in Human Behavior*, *109*, 106351.

Nunes, A. (2018). *Celular é foco de contaminação e pode causar danos à saúde*. A União, 2018. Available at: <https://auniao.pb.gov.br/noticias/caderno_paraiba/celular-e-foco-de-contaminacao-e-pode-causar-danos-a-saude> Access on 24 de jun de 2023.

Olson, J., & A Mourey, J. (2019). Greater Expectations: Anthropomorphic Products Must Be Warm and Competent... Or Else. In *ACR North American Advances*, 321-331.

Parent, N., & Shapka, J. (2020). Moving beyond addiction: An attachment theory framework for understanding young adults' relationships with their smartphones. *Human Behavior and Emerging Technologies*, *2*(2), 179-185.

Park, C. W., MacInnis, D. J., Priester, J., Eisingerich, A. B., & Iacobucci, D. (2010). Brand attachment and brand attitude strength: Conceptual and empirical differentiation of two critical brand equity drivers. *Journal of marketing*, *74*(6), 1-17.

Puzakova, M., & Aggarwal, P. (2018). Brands as rivals: Consumer pursuit of distinctiveness and the role of brand anthropomorphism. *Journal of Consumer Research*, *45*(4), 869-888.

Ramos, T. (2022). *Aparelho celular é fonte de contaminação que não pode ser desconsiderada; infectologista explica*. Estadão. Available at: <https://www.estadao.com.br/emais/bem-estar/aparelho-celular-e-fonte-de-contaminacao-que-nao-pode-ser-desconsiderada-infectologista-explica/> Access on 25 de jun. de 2023.

Schifferstein, H. N., & Zwartkruis-Pelgrim, E. P. (2008). Consumer-product attachment: Measurement and design implications. *International journal of design*, *2*(3), 1-13.

Singh, R. (2022). "Hey Alexa–order groceries for me"–the effect of consumer–VAI emotional attachment on satisfaction and repurchase intention. *European Journal of Marketing*, *56*(6), 1684-1720.

Spataro, G., Burgassi, S., Cevenini, G., Nante, N., Tani, M., & Messina, G. (2018). Smartphone or Crossphone: Contamination at Hand. *American Journal of Infection Control*, *46*(6), S32.

Tandon, A., Kaur, P., Dhir, A., & Mäntymäki, M. (2020). Sleepless due to social media? Investigating problematic sleep due to social media and social media sleep hygiene. *Computers in human behavior*, *113*, 106487.

Tsai, S. P. (2011). Fostering international brand loyalty through committed and attached relationships. *International Business Review*, *20*(5), 521-534.

Tsai, S. P. (2014). Meaning threats heighten consumer attachment: implications for global brand management. *European Management Journal*, *32*(6), 991-1000.

Thomson, M., MacInnis, D. J., & Whan Park, C. (2005). The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *Journal of consumer psychology*, *15*(1), 77-91.

Underwood, B., Birdsall, J., & Kay, E. (2015). The use of a mobile app to motivate evidence-based oral hygiene behaviour. *British dental journal*, *219*(4), E2-E2.

Velasco, F., Yang, Z., & Janakiraman, N. (2021). A meta-analytic investigation of consumer response to anthropomorphic appeals: The roles of product type and uncertainty avoidance. *Journal of Business Research*, *131*, 735-746.

Wan, E. W., & Chen, R. P. (2021). Anthropomorphism and object attachment. *Current Opinion in Psychology*, *39*, 88-93.

Wan, E. W., Chen, R. P., & Jin, L. (2017). Judging a book by its cover? The effect of anthropomorphism on product attribute processing and consumer preference. *Journal of Consumer Research*, *43*(6), 1008-1030.

Wang, F., & Basso, F. (2019). "Animals are friends, not food": Anthropomorphism leads to less favorable attitudes toward meat consumption by inducing feelings of anticipatory guilt. *Appetite*, *138*, 153-173.

Wang, L., Touré-Tillery, R., & Lisa McGill, A. (2019). When the flu speaks: the effect of disease anthropomorphism on protection motivation. *ACR North American Advances*., *47*, 321-331.

Ward, A. F., Duke, K., Gneezy, A., & Bos, M. W. (2017). Brain drain: The mere presence of one's own smartphone reduces available cognitive capacity. *Journal of the Association for Consumer Research*, *2*(2), 140-154.

Waytz, A., Epley, N., & Cacioppo, J. T. (2010). Social cognition unbound: Insights into anthropomorphism and dehumanization. *Current Directions in Psychological Science*, *19*(1),

58-62.

Wolniewicz, C. A., Tiamiyu, M. F., Weeks, J. W., & Elhai, J. D. (2018). Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. *Psychiatry research*, *262*, 618-623.

Wu, T., Lu, Y., Gong, X., & Gupta, S. (2017). A study of active usage of mobile instant messaging application: An attachment theory perspective. *Information Development*, *33*(2), 153-168.

Xiaofei, Z., Guo, X., Ho, S. Y., Lai, K. H., & Vogel, D. (2021). Effects of emotional attachment on mobile health-monitoring service usage: An affect transfer perspective. *Information & Management*, *58*(2), 103312.

Xie, Y., Chen, K., & Guo, X. (2020). Online anthropomorphism and consumers' privacy concern: Moderating roles of need for interaction and social exclusion. *Journal of Retailing and Consumer Services*, *55*, 102119.

Yang, L. W., Aggarwal, P., & McGill, A. L. (2020). The 3 C's of anthropomorphism: Connection, comprehension, and competition. *Consumer Psychology Review*, *3*(1), 3-19.

Yuan, L., & Dennis, A. R. (2019). Acting like humans? Anthropomorphism and consumer's willingness to pay in electronic commerce. *Journal of Management Information Systems*, *36*(2), 450-477.