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RESEARCH ARTICLE

Virtual relationships: Anthropomorphism in the digital age

Mayu Koike[1] | Steve Loughnan[2]

[1]Department of Psychology, Hiroshima University, Higashihiroshima, Japan

[2]Department of Psychology, University of Edinburgh, Edinburgh, UK

Correspondence
Steve Loughnan, Department of Psychology, University of Edinburgh, Edinburgh, UK.
Email: steve.loughnan@ed.ac.uk

Abstract

For most of human history we have ascribed human-like capacities to other entities (anthropomorphism). Recently, the digital age has created new entities: *virtual agents* (VAs). Increasingly, these virtual entities are complex and human-like, specifically designed to elicit anthropomorphism from their owners and users. We employ social psychological research and theory to review how, why, and when people come to anthropomorphize VAs. Moving beyond static representations, we examine the dynamics of human-VA relationships and how they are encroaching on the closest of human relationships, virtual love. We use the social psychology of close relationships to examine the ways in which people may form, maintain, and terminate relationships with VAs. We conclude by examining the potential costs and benefits of these new relationships.

KEYWORDS
anthropomorphism, close relationships, digital technology, relationships, social bonds, technology, virtual agents

In 2009, Sal got married. In some ways, his story was unremarkable; he had been in a relationship with Nene for years, they lived together and went on holidays, and he loved her very much. Nene was, however, a video game character from KONAMI's "LovePlus" for Nintendo (Lah, 2009). In the game players select a partner, nurture a relationship, interact tactilely through the Nintendo, fall in love, and sometimes even marry in real life. While it would be easy to dismiss Sal as an anomaly—precious few people marry virtual characters (Jozuka, 2018)—his case represents an extreme form of a more widespread phenomena, our increasingly *social* relationship with virtual agents (VAs).

It is difficult to overstate the depth, breadth, or pace of change in virtual technology in the last 50 years. Amongst these changes, we argue that the rise and rise of VAs reflects one of the most psychologically important, yet systematically neglected aspects of this virtual advance. In just a few decades VAs have spread into our homes, our offices, and our leisure time. We argue that our relationship with these agents is fundamentally *social*; in many ways people interact with VAs as if they were social beings. As a field, social psychology is well-positioned to understand these nonhuman social relationships.

We begin by outlining the role of VAs in modern life and summarizing the existing, limited social psychological literature on our relationships with machines, both virtual and traditional. We argue that contemporary social psychological models (e.g., the SEEK model) and current human–computer interaction models (e.g., social presence) are valuable but limited approaches to understanding our relationships with VAs. We conclude that the psychological concept of anthropomorphism—thinking about nonhumans as if they were human—is both a powerful tool to help us understand our current relationship with VAs and is a promising avenue for future research. After summarizing this existing work, we employ the psychology of close relationships to help move the field of anthropomorphism beyond static and motivational accounts of why we anthropomorphize towards understanding the dynamic psychological processes involved in forming, maintaining, and terminating human–virtual agent (HVA) relationships. In doing so we aim to highlight some fruitful avenues for future research.

1 | THE RISE OF VAs

Fifty years ago, VAs did not exist in a meaningful psychological sense. Cartoons and basic video games included some elements, but these agents were either totally unresponsive or extremely limited in their range of responses to human input (Schroeder & Epley, 2016). Put simply, these VAs did not appear particularly agentic.

VAs were initially developed for our entertainment. In the mid-1980s, video games introduced interactive, nonplayer characters; VAs who not only spoke and moved like the player but responded dynamically to player inputs. Over the course of 40 years these VAs have become increasingly complex, responsive, and commonplace. Characters like Mario and Pikachu became childhood companions, whilst games aimed at an older audience (e.g., Tomb Raider) launched hugely popular human characters (e.g., Lara Croft). Modern mobile games (e.g., Pokémon Go) have made VAs daily companions for millions of people. Put simply, in a short period of time VAs have become integral to the world's most lucrative entertainment industry.

By the late-1990s, Microsoft's infamous paperclip "Clippy" brought VAs from videogames into the workplace for help and humor (Nelson & Churchill, 2008). In some domains, these VAs replaced humans, working in call centers for sales (Bateh, 2019) and to provide customer care (Lacity et al., 2017). In a short period of time, VAs became coworkers. Most recently, VAs have entered our homes as domestic assistants. Amazon (Alexa), Google (Google Assistant), and Apple (Siri) have all introduced VAs to inform, entertain, and assist us around the house. A generation of children are growing up in homes with VAs, interacting with VAs as if they were human beings (Popovici et al., 2004). Sales of these domestic VAs continue to rise (Insider Intelligence, 2021) and with more of us working from home, our contact with domestic VAs is set to increase. In just 50 years VAs have become commonplace in entertainment, workplace, and family homes.

2 | THE SOCIAL PSYCHOLOGY OF OUR RELATIONSHIP WITH MACHINES

Although social psychologists are well-positioned to study how we think, feel, and act towards social objects, work on this topic has been limited and narrow in focus. For instance, within the field of consumer psychology the factors which lead us to buy certain objects are well-studied (e.g., Rauschnabel & Ahuvia, 2014). Beyond the psychological determinants of the motivation to acquire possessions, object ownership can meaningfully change the way we think

about ourselves. For example, object ownership has been robustly linked to expansion of the self-concept; people psychologically grow the self by incorporating objects into their psychological lives (de Kerviler & Rodriguez, 2019; O'Cass & Frost, 2002). Similarly, people believe that by possessing an object they psychologically incorporate some of the attributes of that object, whether they be positive or negative (Nemeroff & Rozin, 1989). For instance, recent work has shown that the mere ownership of a painkiller leads people to feel less pain, even before the painkiller is used (Wai-Lan Yeung et al., 2020). Finally, we use objects as important cues to inform our judgments of other people. For example, people who own expensive cars tend to be viewed as more attractive (Dunn & Searle, 2010). Combined, this research indicates that more than being "mere things," people engage with objects at a deeper psychological level.

One fruitful approach has been to explore the ways in which people think about the psychological qualities of the objects they encounter. This line of work has shown that people sometimes use similar social cognitive processes in thinking about objects as they do when thinking about humans. Anthropomorphism refers to the tendency to think about non-human entities such as objects as if they were human (Epley et al., 2007; Soanes & Stevenson, 2005). Ample work in recent years has explored our tendency to think about objects and machines in human-like ways.

At a basic level, we know that objects that tend to look, sound, or act human also tend to be thought about as if they were human. For instance, people judge an amorphous object moving at human-like speeds as more "mindful" (intentional, self-aware) than objects moving faster or slower than humans (Morewedge et al., 2007). Similarly, it is well-established in social robotics that robots which are human-like in appearance, voice, or gait are perceived as having more complex minds (e.g., Richert et al., 2018; van Pinxteren et al, 2019; Vanman & Kappas, 2019). In short, when objects appear human-like, we tend to think of them in human-like ways.

The SEEK model (Epley et al., 2007) has been the major social psychological theory to organize our understanding of anthropomorphism. As a motivational model, SEEK aims to capture the reasons why people anthropomorphize. In addition to anthropomorphizing when an object appears human-like, people are likely to anthropomorphize when they lack social connections (sociality motive) or want to understand the behavior of a complex object or system (effectance motive). There is considerable evidence for the role of sociality, effectance, and object appearance in motivating people to anthropomorphize (Bartz et al., 2016; Chen et al., 2017; DiSalvo & Gemperle, 2003; Eyssel et al., 2011; Gardner et al., 2005; Rom & Mikulincer, 2003; Waytz et al., 2010). Furthermore, it is likely that the same motives that lead to anthropomorphism in a nondigital domain also apply to the digital world. Although influential, the SEEK model only tells us part of the story of anthropomorphism; specifically, *why* people want to anthropomorphize. We argue that people not only think about nonhuman entities as if they were human, but they also form relationships with them as if they were human.

The types of relationships people form with nonhuman entities in the virtual domain been studied outside of social psychology in the allied discipline of human–computer interactions. Researchers in this domain have studied the ability of virtual entities to create a social presence (K. Kim, 2018). Social presence refers to the capacity of a virtual entity to make the interaction feel like an interaction with a real, live human (Nowak & Biocca, 2003). Virtual entities vary in their ability to create this human-like interactive experience and this variability in social presence meaningfully determines the amount of engagement, enjoyment, and trust in the interaction (Chattaraman et al., 2012; Jin, 2011; Liew & Tan, 2018; Skalski & Tamborini, 2007). For example, entities which generate more social presence can exert more social influence and are more persuasive (Skalski & Tamborini, 2007). One robust finding in the literature is that anthropomorphized entities generate more social presence (T. Kim et al., 2020; Skalski & Tamborini, 2007; Van Doorn et al., 2017). Importantly, researchers studying social presence have focused heavily on the ability of avatars—virtual entities operated by humans—to generate social presence. They have paid considerably less attention to the ability of autonomous VAs to also generate social presence.

Currently, much remains to be known about our social relationship with VAs. Psychologists have carefully studied the processes underlying object choice (Bettman et al., 2008) and how owning objects impacts how we think about ourselves (Escalas & Bettman, 2009) and others (O'Cass & Frost, 2002). One important direction has been to examine the extent to which people think about objects as if they were human—the extent to which they anthropomorphize them. Contemporary social psychological models of anthropomorphism focus exclusively on the

motivations underlying why we anthropomorphize (e.g., Bartz et al., 2016; Chen et al., 2017; Epley, Akalis et al., 2008; Gardner et al., 2005) and can help us understand why people might start anthropomorphizing VAs (e.g., Brown et al., 2004; Epley, Waytz et al., 2008; Koike et al., 2020; Morris et al., 2007; Tam, 2014; Waytz et al., 2010). This focus on why we anthropomorphize is coupled with a relative neglect of the more dynamic, social elements of *how* we anthropomorphize. Put simply, while we know much about why someone would see a VA as human, we know little about the type of social relationships a human and VA could develop. The social impact of virtual entities has been well-studied outside of social psychology and we know that virtual entities can generate a social presence. However, much of this work focuses on avatars operated by humans, rather than VAs as social objects. The remainder of this paper will draw heavily on the social psychology of close relationships to take a deeper look at how anthropomorphism can help us understand the types of relationships humans and VAs can form.

3 | HVA RELATIONSHIPS

Recent technological advances have created VAs that have begun to replicate human-to-human relationships (Brooks, 2021). For example, Nintendo's "Animal Crossing: New Horizons" is Amazon's bestselling video game of 2021 (Best Sellers of 2021, 2021). Players interact with VAs on their virtual island to build a home. They communicate to these VAs, come to understand their needs and relationships, exchange gifts, and help them. In short, they become "friends" with these VAs. In the same market, romantic video games reflect the cutting edge of virtual anthropomorphism as they strive to mimic the most intimate of human relationships: love. Psychological research has begun to examine the role anthropomorphism plays in building these types of HVA relationships.

Recent work has begun to specifically examine the ways in which people form relationships with VAs. For example, Koike et al. (2021) asked participants to interact with romantic VAs and examined how anthropomorphism could serve to increase the feeling that the virtual relationship is "real." Three experiments revealed that the more people were able to anthropomorphize VAs, the more authentic they found the relationship to be. This feeling of relationship authenticity was itself consequential, predicting more willingness to continue the relationship and more positive affect. In short, this study provides preliminary evidence that anthropomorphism plays an important role in virtual relationships, helping establish the bonds between people and VAs.

Despite these promising results, it is fair to say that HVA relationships are currently understudied. We know that people anthropomorphize VAs and that this can make relationships with VAs more enjoyable (Koike et al., 2021). If people think about VAs in human-like ways, they may employ the same social cognitive processes to form, maintain, and terminate relationships with VAs. Social psychologists have long and extensively studied relationship processes (Eastwick, 2016) in both the romantic and platonic domain (e.g., Hill & Davis, 2000; Ogolsky et al., 2017). In the following sections we summarize major psychological factors in relationship formation, maintenance, and termination and examine how these might apply to HVA relationships.

4 | RELATIONSHIP FORMATION

Partner selection is the first step in relationship formation. Initial attraction to form both romantic and platonic relationships between humans is partially driven by perceived attractiveness (Montoya, 2008). For example, in romantic contexts men tend to prefer shorter and younger women, as both are arguably indicators of high fertility (Nettle, 2002), whereas women prefer older and taller men, as both may signal increased capacity to provide (Kenrick, 1992; Pawlowski et al., 2000). Attractiveness plays a similar yet smaller role in pursuing friendships, with people typically preferring to form a friendship with a more attractive person (Zakin, 1983). Unlike humans, VAs can be designed to maximize their physical attractiveness in general and can be tailored to maximize their attractiveness for specific perceivers. This adaptability and flexibility in the appearance of VAs allows them to

exploit our tendency to seek to initiate relationships with attractive people. At present, we know of no work examining whether people are more likely to form relationships with VAs they consider more attractive.

Physical proximity is a second major determinant of relationship formation. When forming a relationship people benefit from regular interpersonal contact and proximity is a key mechanism for achieving this contact. This proximity is typically spatial; people who tend to live close to each other have more likelihood of becoming friends (Back et al., 2008; Festinger et al., 1950; Johnson, 1989) and romantic partners (Ellison et al., 2012; Hamilton, 2016). A range of VAs have been developed to operate in close physical proximity to humans. Domestic assistants such as Alexa and Siri share the house with their owner and romantic video games which seeks to nurture HVA relationships are typically available on smartphones, making them readily accessible. In addition to residing within the same physical space, VAs are permanently and immediately available for human interaction. Whereas time of day and physical distance serve as barriers to pursuing relationships with other people, VAs close colocation and immediate accessibility leaves them well-positioned to exploit our tendency to form relationships with people we meet regularly. Currently, we know of no work examining the role that proximity and familiarity play in initiating HVA relationships.

In the initial phases of relationship formation, people often use similarity as an indicator of whether they should invest in a relationship. This similarity can be both real and perceived (Montoya et al., 2008) and is established quickly in interaction with a potential partner (Tidwell et al., 2013). Importantly, similarity is consequential; high similarity leads people feel more secure and comfortable with the potential partner (Bleske-Rechek et al., 2009; Burleson et al., 1994). Here we see an important potential hurdle to forming HVA relationships. If VAs are perceived as meaningfully dissimilar to humans—lacking physical bodies, coded by a programmer—then people may be hesitant to invest in the HVA relationship. By contrast, if VAs are perceived as similar—anthropomorphized—people could feel the comfort and security which leads to deeper investment in the HVA relationship. Currently, we know of no work examining perceived similarity between people and VAs, nor the impact of these judgments on relationship formation.

In the process of determining similarity, people often employ self-disclosure. Revealing personal information about the self helps build rapport and trust (Abbe & Brandon, 2014; Gibbs et al., 2011) and increases liking and perceived closeness (Slatcher, 2010; Sprecher & Duck, 1994). Interestingly, disclosures work both ways; listening to a self-disclosure typically increases perceived similarity and positivity for both the listener and discloser (Sprecher et al., 2013). The tendency to self-disclose is not limited to human audiences. Previous research has found that people, particularly women, are likely to self-disclose to social robots (Uchida et al, 2020). Again, we know of no work examining the role of either offering or receiving self-disclosures in building a HVA relationship.

In some ways VAs are well-positioned to capitalize on the elements that comprise successful relationship formation. VAs' considerable scope for physical appearance and ready availability render them able to capitalize on our tendency to form relationships with attractive, proximal others. By contrast, the more social elements of relationship initiation may prove less reliable. Whether people perceive similarities with VAs and are ready to offer and receive self-disclosures is an important research question, which likely hinges off the extent to which the VAs are anthropomorphized.

5 | RELATIONSHIP MAINTENANCE

Previous psychological research has extensively studied how we maintain good relationships. Typically, good relationships are taken to be those high in relationship satisfaction as people generally have a good (if sometimes biased; Halford et al., 2018) gauge on how their relationship is going. Relationship satisfaction is clearly a composite (Fincham et al., 2018), but at least includes emotional connection, responsiveness, and physical intimacy.

Emotional connection is critically important for maintaining close relationships. Feeling accepted and under-stood by your partner fosters relationship satisfaction (Cramer, 2003); for example, couples who receive emotional

support from their partner report greater satisfaction (Cramer, 2004). This relationship appears causal: increased perceived emotional support from a partner directly leads to higher relationship satisfaction (Lawrence et al., 2008). One form this emotional connection can take is dyadic empathy, a form of emotional support strongly associated with relationship satisfaction (Busby & Gardner, 2008; Kimmes et al., 2014). Emotional connection by means of empathy not only builds satisfaction but also reduces depression and conflict (Cramer & Jowett, 2010). In short, emotional connection—caring about the other (support and empathy) and responding to them emotionally—is an important ingredient in a satisfying relationship. While recent work has demonstrated that people do feel a connection to VAs in a relationship and this elicits a positive emotional response (Koike et al., 2021), more specific emotional and empathetic processes are currently unstudied.

In addition to emotional connection, partner responsiveness—whether someone shows understanding, validation, and caring for their partner (Gable & Reis, 2006)—is an important element for a satisfying relationship. Responsiveness is a key factor in building intimacy (Laurenceau et al., 1998; Reis & Shaver, 1988), powerfully determines relationship satisfaction (Gadassi et al., 2016), and increases relationship quality (Reis & Gable, 2015), and levels of self-disclosure (Manne et al., 2004). Importantly, actual responsiveness is less critical than perceived responsiveness (Reis et al., 2004). Responsiveness poses a particular challenge for VAs. Currently, VAs are interactive and agentic within limits directly programmed. For example, the early ELIZA chatbot seemed human-like when responsive, yet rapidly lost this feeling when responsivity broke down (Ekiba, 2008). This severely restricts the range of responses that a VA can deploy relative to a human. An analogous problem is routinely encountered in social robotics, where the scope of responses is relatively limited (Pelikan, 2015). Given the centrality of responsiveness in maintaining a good relationship, overcoming this responsivity bottleneck would represent an important step forward in our ability to form HVA relationships. Again, we know of no work examining whether people are more likely to invest in a HVA where the VA is perceived as more responsive.

In addition to emotional closeness, physical intimacy is an important element of close, romantic relationships. An association between relationship satisfaction and sexual satisfaction is widely reported (Haavio-Mannila & Kontula, 1997) for both sexes (Fallis et al., 2016), and sexual satisfaction enhances marital quality and increases relationship stability (e.g., Sprecher, 2002; Yeh et al., 2006). To the extent that an increasing number of VAs are aiming to build close romantic relationships with people, their inability to provide physical intimacy may represent an important limit on HVA relationships.

Emotional connection, responsiveness, and physical intimacy are cornerstones of good human relationships (Canevello & Crocker, 2010; Yoo et al., 2014). To date, no research has examined whether the same factors that serve to enhance and maintain human relationships are equally efficacious at improving the quality of HVA relationships. While we know that people think of VAs in human-like ways, whether they in turn employ human relationship processes within HVA relationships is currently unknown.

6 | RELATIONSHIP TERMINATION

Many relationships will end. While multiple factors lead people to terminate relationships, two major contributors are imbalanced costs and rewards, and the presence of attractive alternatives. To what extent might we expect each of these factors to operate within HVA relationships?

Relationships provide numerous rewards, require investments of time and energy, and entail important sacrifices. The balance of costs and benefits in determining whether a relationship persists are carefully articulated as Social Exchange Theory (Homans, 1961). When people feel the investment is equal between partners, they feel committed to the relationship (Huston & Burgess, 1979) and mismatches that benefit one partner can elicit guilt and resentment (Guerrero et al., 2008). If the relationship becomes too unequal, with rewards accruing for one partner and costs for the other, relationship dissolution becomes more likely (Simpson, 1987). We could apply similar cost/benefit analyses to HVA relationships. In a romantic context, VAs often have only a small number of

options, rendering the relationship repetitive and the rewards of the relationship could sharply diminish over time. Accordingly, people may view HVA romantic relationships as increasingly costly and thus terminate them. By contrast, domestic assistants like Amazon's Alexa are becoming more competent and capable over time, increasing the rewards of the HVA relationship while holding costs stable. Thus, it seems possible that updates to domestic assistants lead to stronger HVA relationships as they improve the cost-benefit ratios. An investigation of perceived costs and benefits for HVA relationships could help us understand why these relationships end.

Attractive alternatives—when partners see an alternative state (e.g., another relationships) that is more attractive than their current relationship (Levinger, 1976)—play a central role in understanding relationship (in) stability (Finkel et al., 2017), and are integral to major theories in the field (Rusbult, 1983; Thibaut & Kelley, 1959). When people see many viable attractive alternatives to their current relationship, they are more likely to leave that relationship (J. Kim, 2013; Le et al., 2010). Theorists have pointed out that "attractive alternatives" includes both other people and being single (e.g., McNulty et al., 2018). We would propose another, looming attractive alternative: being in a HVA relationship.

With their low-cost, endless accessibility and wide variety, VAs which are specifically programmed to please us could present a genuine relationship threat. Critically, we think this attraction hinges off the entities being anthropomorphized. When a VA is anthropomorphized, it could better help meet the needs identified in the previous section (e.g., responsiveness), needs that are perhaps not met by a current human partner. While it is unlikely that a person would leave a relationship with another person to be with a VA, if that VA is sufficiently anthropomorphized it may activate the longstanding role that attractive alternatives play in relationship dissolution. The threat of attractive VA alternatives should be most potent in the early stages of a relationship. As relationships progress, they tend to increase in commitment (Arriaga & Agnew, 2001). Prior work suggests that individuals who feel committed to their current partner reduce attention towards attractive alternatives (Maner et al., 2008; Rusbult, 1980).

The destabilizing effect of attractive alternatives on relationships is counterbalanced by a range of biases people possess against alternative partners. Broadly, people in satisfying relationships devalue alternative partners (see Amato & Previti, 2003; Durante et al., 2016). These alternatives are perceived as less desirable (Simpson et al., 1990), capture less attention (Maner et al., 2008), are less memorable (Karremans et al., 2011), and we are less warm towards them (Karremans & Verwijmeren, 2008). In short, satisfied couples possess biases to reduce the threat of attractive alternatives. With a growing number of people in increasingly human-like relationships with VAs, might we expect the same biases to reduce the "threat" of a relationship with another person? Could satisfying HVA relationships—the very type of relationships that programmers are progressing towards—make it harder for people to form relationships with other humans? There is at least some proof of concept with several people marrying VAs formally forsaking alternative partners. If we are in a satisfying HVA relationship, then we may devalue alternative human partners.

At present, little work has looked directly at the role of relationship processes in HVA relationships. This reflects an important step for anthropomorphism research, to move beyond understanding why people begin to anthropomorphize to understand how we form, maintain, and end relationships with objects. We have adopted this dynamic approach to anthropomorphism in the rapidly expanding domain of VAs, yet see no reason why a similar approach could not be adopted for other typical targets of anthropomorphism, such as animals and gods.

7 | CONCLUSION

In just 50 years, VAs have gone from non-existence to potential everyday companions in our psychological world. Understanding how we think about and relate to VAs is becoming relevant for an increasing number of people; homemakers, office workers, videogamers. As social psychologists, we can already contribute much towards understanding what motivates people to anthropomorphize and how anthropomorphized VAs generate a social

presence in virtual environments. Currently, lacking is an understanding of the dynamics of how people form, maintain, and terminate relationships with VAs. We argue that by drawing on the wealth of relationship science that social psychology has gathered we can generate testable hypotheses about the types of relationships people form. As VAs grow increasingly common and complex in the world around us, we can lead the way in understanding these new relationships.

CONFLICT OF INTEREST

The authors declare that there are no conflict of interests.

ORCID

Steve Loughnan https://orcid.org/0000-0002-4737-5120

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AUTHOR BIOGRAPHIES

Mayu Koike is a lecturer at the University of Hiroshima. Her work focuses on the relationships between people and virtual agents. Specifically, she looks at how we can use relationships research to understand new technologies.

Steve Loughnan is a Reader at The University of Edinburgh. His work examines how and when we extend humanity to others, and the impact this has on our moral judgments and relationships with them.