



Purr-ogrammed love: A narrative review of virtual pets

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ARTICLE INFO

Keywords:

Virtual pets
Cyber pets
Digital pets
Digital ownership
Gendered toys
Capitalist design
Narrative review
Facilitated healthcare

ABSTRACT

In the '90s *Tamagotchi* (Tamagotchi, 1996) and virtual pets were cultural touchstones of the personal computer and handheld game console revolutions. Despite continued popularity, virtual pets remain under-researched. A narrative review was conducted to identify key themes in the literature surrounding virtual pets. 45 articles were included. Reflexive thematic analysis identified six major themes: life and death, health and habits, capitalism and consumption, gender, toys and play, and ethics. Virtual pets serve purposes beyond entertainment, including managing physical and emotional well-being and aiding in learning. Virtual pet gameplay is also seen to challenge normative notions of productivity and purpose. This review brings together decades of academic interest in virtual pets across disciplines to better understand their enduring cultural significance.

1. Introduction

The market arrival of *Tamagotchi* [1] has been described as meteoric ([2], p. 285). Their immense arrival onto toy-shelves and children's key-chains was emphasized all the more by their equally sudden disappearance [2]. Many do not know that: While it may seem that *Tamagotchi* [1] and other virtual pets have been cast out towards obscurity, continued market success indicates a deeply invested fan base, still enchanted by virtual creatures. *Tamagotchi* [1] itself boasts 43.73 million units shipped since 2004 - with more than 80 million units sold since their inception [3]. This enduring phenomenon points to meaningful engagement with virtual creatures. Despite their clear cultural importance, there is a dearth of knowledge surrounding virtual pets. It is unclear if they are video games, simulators, both, or something else entirely. One reason for a lack of information may be that video games (a category virtual pets may fall under), despite growing evidence on their capacity to "do good" [4], are still subject to biases where many see them as little more than entertainment. At the time of *Tamagotchi's* [1] inception (1996), there were also clear expectations of who played and designed video games, namely, boys [5]. Dispelling this expectation with a fundamental change in game design and with a female primary designer [6], *Tamagotchi* [1] was the herald of significant changes in how we understand screen-based play. The change continues. At least 46% of current game-players identify as female [7]. It has become socially accessible, acceptable, and

at times even *necessary* for female social bonding [8]. Exploring virtual pets is more universally beneficial and resonant than ever before.

To the authors' knowledge, there has been no previous attempt to collect or summarize the range of academic texts that discuss virtual pets. By extension, no collection of the key themes and patterns that may re-appear in the literature. We offer our scope as a working definition of a virtual pet, based on articles that provide a description of what they consider a virtual pet [9,10]. A narrative review allows a meaningful synthesis [11] of literature while also using a reflexive acknowledgment of the researcher to provide novel insights and interpretations. One motivation for this narrative review is to compile a unified collection of virtual pet literature, providing interested readers with easier access to relevant research that is currently difficult to locate.

Some studies make predictions and observations of virtual pet "games" over the years [12], while others focus on identifying the key components of virtual pets as they exist today [13]. Some papers, such as Tsai's doctoral thesis *The effects of interacting with a computer-simulated virtual pet dog on children's empathy and humane attitudes* [14] do collate *some* of the literature surrounding virtual pets to create a pool of contextual understanding. Our goal is to collate an extensive amount of virtual pet literature to observe consistently re-occurring themes, ideas and concerns. A collection of different virtual pet articles and narrative interpretation to this scale has, to our knowledge, not been previously completed. This exploration is guided by the question:

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“What are the key themes currently explored in literature discussing actualized virtual pets?”

2. Methodology

2.1. Methodology part one: A scope for virtual pet

Our first objective of the narrative review was to scope “virtual pet” based on the literature. Researchers used academic texts to identify the key features of a virtual pet. One of the first decisions made when defining a scope was whether a virtual pet had to be entirely software-simulated (such as Ubisoft’s *Petz* [15] PC games), or if creatures such as the robot seal *Paro* could qualify as a virtual pet. It was decided that *Paro* [16] and their similar counterparts have advantages to generating relationships and meaning that a software simulated creature does not. They are robots with tangible fur and an indexical realism to the furry creatures that inspired them. Thus, they were omitted as qualifying as “virtual pets”. The ability for a fuzzy robot to create meaning-making, while still complex, nuanced and fascinating, is not fascinating in the same way as is the case for a creature who has no fur to covet love from. Our discussion of *Tamagotchi* [1] does not fall under the category of robot pet. The *Tamagotchi* [1] hardware, an egg shaped toy, is visually dissimilar to the *Tamagotchi creature* (also known as the *tama*) that the software screen depicts. This is the creature that users interact with. It was decided that embodied creatures who exist within a non-animal-shaped vessel, such as the egg-shaped *Tamagotchi* [1] case, can classify as a virtual pet. The egg shape of the *Tamagotchi* [1] device certainly offers it portability and convenience, which likely offers it levels of meaning-making that may be barred from creatures such as the *Petz* 5 dogs and cats (*Dogz* and *Catz* who are restricted to their CD ROMS), but it does not offer a soft, sensory pleasure or indexicality to a true living creature. Consider the *Tamagotchi* [1] device as a portable cage for the virtual pet (the *tama*) within. When discussing relationships to *Tamagotchi* [1] in the context of this narrative review, it can be assumed that we are referring to the software creature of a *Tamagotchi* [1] (the *tama*) unless otherwise specified.

2.2. Methodology part two: Calibrating a narrative review

The narrative review aims to identify key themes in the literature on virtual pets. As our interest was in the relationship between users and virtual pets, the authors selected articles that discussed virtual pets that were at a playable prototyping phase and discarded those that only talked about theoretical application. As we are interested in the relationships between users and screen-based virtual pets, we did not explore robotic toys such as *Furby* [17] or the robotic toy seal *Paro* [16]. While a *Tamagotchi* [1] exists inside of a toy plastic egg, the creature itself (often referred to as a “*tama*”) is screen-based. Thus, articles discussing *Tamagotchi* [1] and other screen-based portable virtual pets were included. Our search string included “virtual pets”, “digital pets”, “artificial pets” and “cyber pets” as well as singular, single-word, and hyphenated variations (e.g., “cyber pet”, “cyberpets” and “cyber-pets”). We supplemented the search with four exceedingly popular virtual pet games “*Tamagotchi* [1]”, “*Nintendogs* [18]”, “*Star Stable* [19]”, and “*Neopets* [20]”. Nine electronic databases were used for the collation of data: *Taylor & Francis*, *Academia.Edu*, *Go-Gale*, *ProQuest*, *SAGE*, *Springer*, *IEEE Xplore*, *ACM Digital Library* and *ResearchGate*. References were explored through backward and forward searching, as well as searching author names. A narrative review asks for a “subjective examination” on the body of literature [21]. The study collection process was deemed complete when we consistently encountered previously identified articles, indicating to the team that relative saturation had been achieved [22,23].

Titles and abstracts were read and reviewed by one author to evaluate relevance to the research question. To determine inclusion, we used the following criteria:

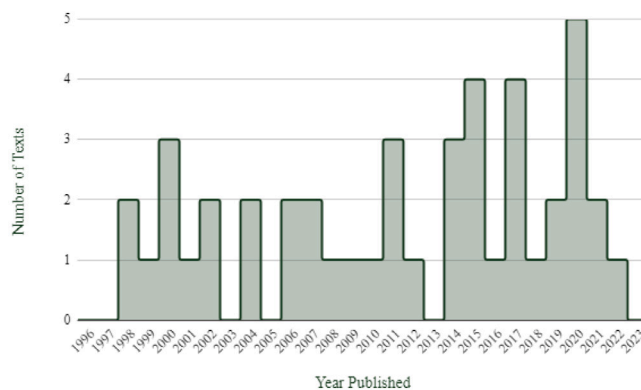


Fig. 1. A stacked stepped area chart illustrating the volume of juried articles related to virtual pets published each year.

- The article needs to be written or translated into English.
- The article must dedicate at least one paragraph or section to “actualised” virtual pets (pets that existed within a playable prototype tested by at least one user).
- The article must be academic and not from popular media such as blogs and newspapers. The article must be peer-reviewed, juried (e.g., book chapters and academic workshop proceedings), or a published thesis that has passed academic degree requirements.
- The article must focus on virtual pets, not robotic or soft toys. This criterion meant we excluded some software virtual pets where the dominant focus was on soft toy or robotic toy counterparts, such as *Webkinz* [24] and *Pleo the Dinosaur* [25].

53 articles that appeared to meet the criteria were downloaded and read for further evaluation. For those that fit the criteria, the researchers completed a second pass where we iteratively developed codes in relation to themes and data we noticed consistently emerging in the literature. This is in keeping with both a narrative review methodology that celebrates the “subjective and dynamic” [21], and reflexive thematic analysis, where the subjective coding experience is understood as “resource” rather than “potential threat” to knowledge production [26]. Multiple codes were assigned to articles as we reflexively conceptualized themes [26,27]. Our second pass left us with 45 articles for inclusion. The researchers of this narrative review have compared their process and findings to the suggested *SANRA* scale [28] and have found their work suitable.

3. Findings

The combined approaches of biographic and autoethnographic exploration, data scouring and thematic analysis yield the following scope for a virtual pet:

A virtual pet can be defined as a software-simulated creature, often displaying some level of autonomy, that ultimately relies upon the user who engages with it. The virtual pet provides positive or negative feedback or described well-being in relation to received input – further implying the role of responsibility towards the user.

The first documented mention(s) of virtual pets occurred in 1998. The year 2020 saw the largest publication volume of virtual pet literature (Fig. 1). The researchers of this narrative review identified a trend of likely disciplinary areas that were consistently found to publish articles related to virtual pets. These three domains were: Health, including nursing, psychology, and health innovation; Human-Computer Interaction (HCI), including design and gameplay; and Artificial Intelligence (AI), including artificial life and intelligent learning systems. Next we describe the six major themes identified.

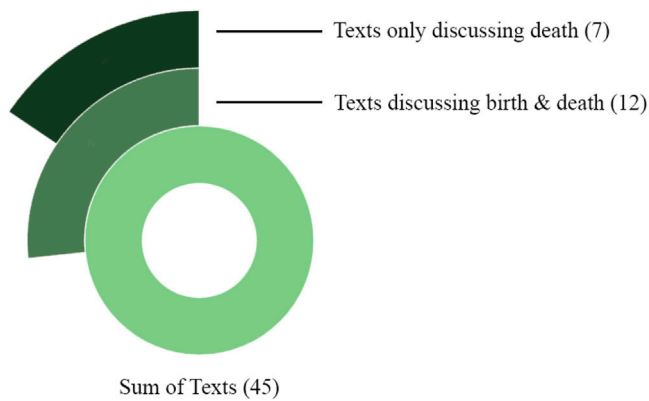


Fig. 2. A sunburst diagram showing that about a quarter of articles mention birth and death, and half of those mention death exclusively.

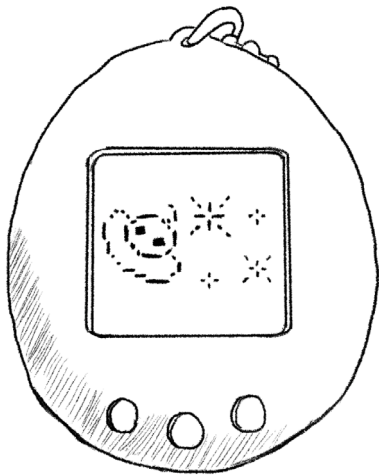


Fig. 3. An illustration of the Tamagotchi [1] device, showcasing the 'end game' screen where the Tamagotchi [1] 'returns to space'. Illustration by the author.

3.1. Theme 1. Trivialization and emotional impact of death and new life

Of 45 texts, 12 discuss birth and death, with 7 focusing solely on death. One of the greatest anxieties for a pet owner is the knowledge that their beloved companion is likely to die before them [29]. This anxiety extends to the "life" of virtual companions, with these anxieties discussed in the earliest virtual software 1996 Bandai's *Tamagotchi* [1] and Author Lab's 1996 *Creatures* [30]. Virtual pets demonstrated the concepts of birth and of death in deeply sanitized ways. Birth is relegated to information pop-ups, eggs hatching, or screens cutting away to a new creature already born. In the case of *Tamagotchi* [1], the *tama* begins as an egg on the software screen. From this egg, the *tama* hatches and the user raises their new virtual creature. The design of death in *Tamagotchi* [1] has taken on different iterations, depending on the release version of the *Tamagotchi* [1,31]. *Tamagotchi* [1] has shifted from using a gravestone and *obaketchi* - a Japanese ghost - to symbolize the *tama*'s death [32] to a more palatable image of *atama* with a halo, or with a *tama* disappearing into the stars (see Figs. 2 and 3), with the description of "death" simply being a "return to space" [33].

As is the case for discussing death in any regard, the discussions of virtual pet "death" varied wildly. Where one theorist saw the designed death of a creature such as the *tama* as trivializing the idea of death holistically [9], another recounted the anguish observed from a user about their departed virtual pet [33]. The "social implication" of trivialized death is that virtual pets may "erode responsibility", as the virtual creature can be "neglected to the point of simulated

death without moral repercussions" ([9], p.2). Yet, the death of a virtual pet has emotional repercussions [33,34], with evidence in the memorial websites and personal accounts discussing grief over *tama* dying [35]. Such grief can be weaponised; Žižek observes that some children overfeed another child's *tama* to the point of its virtual death to bully the original user, knowing that an attachment is formed and its death will cause emotional pain [36].

An important difference between the grief associated with the loss of a virtual pet versus that of a living one is that users are expected to eventually grow bored of their virtual pets. The grief of a virtual pet dying is only felt when the virtual pet *itself* is still interesting. There will (almost always) be the *last* time a person interacts with a virtual pet, and here, "when the user is finally bored of the game, its material "death" is not even noticed" ([34], p.9). Virtual pets may be seen as diminishing the significance of death, downplaying the gravity of its consequences [2,34]. This minimization can affect both the emotional impact of loss and the sense of responsibility humans hold towards the care of living beings.

Virtual pets are celebrated for learning and "care", making them more than "just" a toy [2]; at the same time, their emulated parenthood is critiqued for reducing "poignant experiences" to button pushing without intimacy [37]. The core gameplay loop of a *Tamagotchi* [1] revolves around the inevitability of death. This is different to traditional video games, which often conclude with a final cutscene or a definitive resolution. In many classic games, players progress towards a designated ending. Other games, such as *Candy Crush* [38] can be played *ad infinitum*. Unlike *Tamagotchi* [1], where an absence of play results in *tama* death, games such as *Candy Crush* [38] simply pause and resume when the player returns. Theorist White identifies that since mostly young girls play with *Tamagotchi* [1], the implication of its eventual, inevitable death is that "mothers are utterly responsible for how their children turn out" ([39], p.59) and that an eventual failure of motherhood is unavoidable. We will explore the lens of gender further in 3.4.

3.2. Theme 2. Normative health, habits, and help

22 of the 45 texts related to health, in particular novel ways in which a virtual pet may assist habit forming and maintenance, as "helpers" to alleviate loneliness, or through teaching. Virtual pets are viewed as means to motivate healthy behavior. To encourage exercise, students received smartwatches to track physical activity which was synced with a kiosk displaying a virtual dog. Children activity levels improved the dog's weight and accelerated its ability to learn tricks, which motivated the children to exercise more [40]. In the case of a virtual fish bowl [41], participants could track how their own virtual fish responded to their own exercise (becoming more elaborate and "beautiful" with more steps) as well as seeing other fish. The other fish would belong to other users, promoting a sense of competition in having the most "beautiful" fish. It initially brought attention to levels of physical activity, which many found surprisingly low, but participation declined over time [41].

Creatures, published in 1996, is a virtual pet simulator where the primary creatures ("norm") are capable of "learning" per the Pavlovian model of classical conditioning with positive and negative reinforcement. This game was provided to student teachers for critical reflection on human learning [42]. In competitions of "care", virtual pets motivate students to complete their schoolwork; those with access to competitive statistics made the most effort [43]. As well as nurturing *effort making*, academics are also curious as to how virtual pets may help humans in their nurturance of companionship and empathy. A pet was provided on a tablet in elderly participants' homes and generally enjoyed [44]. Points of concern were privacy and surveillance, as well as turning to the virtual pets when lonely instead of seeking the help of other humans [44]. Empathy gained from a virtual creature does not surpass what has been gained from their living counterparts: virtual

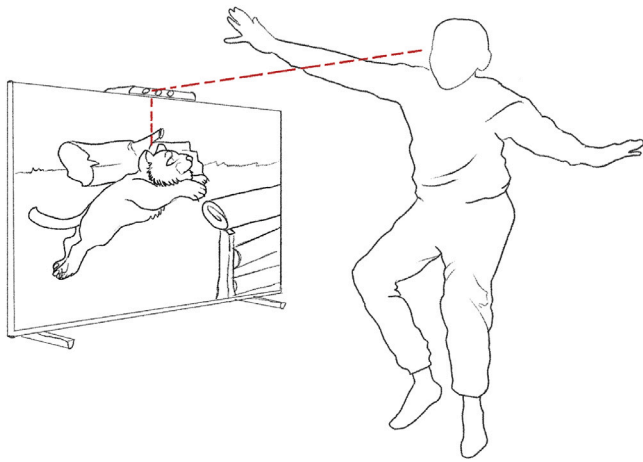


Fig. 4. A diagram illustrating the relationship between a user jumping, the Kinect hardware recording physical movement and a Kinectimal mirroring the user movement by jumping too. Illustration by the author.

pets led to an improvement in empathy in those who had had no previous interactions with real pets, but there was no improvement for those who had previously interacted with real pets [14]. In the health domain, virtual pets are considered to normatively “improve” human lives by encouraging physical activity through their design. There is evidence of virtual pets being useful agents in terms of encouraging user empathy and providing user companionship.

3.3. Theme 3: Capitalist creatures and consumption of love

Of the 45 texts, 10 discuss virtual pets with a capitalist lens. Articles ask what messages are conveyed through the purchasing and advertising of virtual pets, and their implications. Domestication of animals has a long and well-documented history [45]. While largely accepted as a normal and humane practice, some argue that there is an ethical conflict in owning pets. This conflict arises from the contrast between pets as autonomous living beings and their commodification as human-owned property [45,46]. The exchange of money to signify the possession of a life, whether a dog or a virtual pet, fundamentally constitutes a capitalist transaction. Living and virtual pets are acquired primarily for enjoyment, yet in both cases there is the potential for exploitation or neglect [47]. Virtual pets can be abused to “punish” others [36,48,49]. Theorist Wrye utilizes virtual pets to critique the very concept of “pet”, arguing that most literature focuses exclusively on animals labeled as pets rather than analyzing the broader social construct of petness and its application to both objects and animals ([47], p.1035). Wrye contends that petness is not an inherent quality but rather a fluid and socially constructed category ([47], p.1035). The pet relationship by its nature forces the animal to be subservient; owners control “what they eat, where they go, where and when they urinate and defecate, whether they reproduce, and so on” ([47], pp. 1039–1040). This is not necessarily unhealthy, but certainly imbalanced. Virtual pets and alive pets are the same in that we choose to purchase them and then manage their lives.

Virtual pets are seen as vehicles of gendered marketing tactics and as part of prosumer and *creationist capitalism* [50]. *Tamagotchi* [1], in its 1996 conception, lacked the initial *visual* marketing that clearly targeted itself towards boys or girls. After the initial 40 million unit selling success of *Tamagotchi* [1,39], toy brands such as *Bandai* began to create virtual pets with a clearer marketing distinction between the target market of young boys or young girls. For example, *DigiMon* [51] are virtual creatures who evolve into “gross monster characters”, and their plastic casing is available in the colors of brown, gray, blue and neon-green. The plastic casing is also a

rectangular-shaped cage rather than the original *Tamagotchi* [1] egg. The original egg design, with its soft curves and reference to a thing to be nurtured, lean into female design principles [39]. The removal of a reference to an egg reinforces a sense of ownership and mastery rather than that of caregiver, and “downplays the reproductive implications of the design” (p.52, [39]). Virtual pets designed for boys, such as *DigiMon* [51] emphasize action, fighting and violence, while care-taking is emphasized for girls [39]. Gender is further examined in Section 3.4.

Producing and consuming merge within virtual pet play, making users into “prosumers” [52]. Here virtual pets show their encouragement of *creationist capitalism*. In the realm of virtual pets, young children’s imagination and social interactions are leveraged as mechanisms for capitalist gain [52]. For preschool girls, owning a *Nintendog* (a virtual dog from the Nintendo 3DS game *Nintendogs* [18]) became a social necessity, influencing their peer hierarchy [52]. Consequently, children’s social dynamics actively drove the marketing success of *Nintendogs*. This is seen elsewhere. *NeoPets* [20], in its 1999 conception, was advertised as a “virtual community” that allowed children to acquire “life-skills” [53] through raising, feeding and training *NeoPet* creatures, with items like food purchased through completing tasks and mini-games. Users could interact via a digital marketplace, where they may set the own price of their valuables and haggle. *NeoPets* [20], through the encouraging of children to engage in economic transaction, can be seen as raising a capitalist agenda [53]. In exploring the fictitious world of *Neopia*, branded characters and products (e.g., Disney, McDonalds) were pervasive within this fantastical world [53], assimilating children in “consumer citizenship” [53]. The love a user develops for their virtual creature is closely tied to capitalist enterprise, where investments in care create a sense of love [54]. However, reciprocity is inherently absent in this form of “love”, as the virtual pet lacks true agency or life. Ultimately, the relationship is one-sided, with the perceived benefits arising solely from the user’s interpretation of the interactions. The (financially) transactional and capitalist nature of a virtual pet reveals itself. *Kinectimals* [55] is a full-body interaction game using the Kinect [56] that was seen as largely successful in capitalizing love because the time and movement invested by the player is exteriorized in the process of taking the virtual pet through various stages of development (Fig. 4) [54]. Since the player is controlling and interacting with their virtual pet through a whole-body interaction, they may have a “heightened affective connection” not seen in other virtual pet softwares [54]. In summary virtual pets open the door for community, control, love and life as means of increasing financial transactions.

3.4. Theme 4. Gender and ambiguity: Virtual pets and gender roles

To understand the unique ways that virtual pets both conform to gendered expectations [39] and defy them [2], first we must explore their gendered design in terms of marketing and outcome. Only three of the 45 identified texts discuss gender in-depth. *Tamagotchi* [1] was originally designed by mother Aiki Maita from her desire to give her children a pet despite living in a small apartment unsuitable for real animals [6,33]. When Aiki Maita designed *Tamagotchi*, the market audience that she was targeting in her design was Japanese teenaged girls ([39], p.47). While marketed towards teenaged girl with language of care-taking and “raising” the *tama* [39], the *actual* market success transpired beyond gendered binaries [2,33]. From this point: companies started to take notice, and designed with a firmer distinction between virtual pets designed for boys (see *Digimon* [51]) versus those designed for girls (see *Star Stable* [19]). Despite its original target audience, *Tamagotchi*’s [1] packaging did not explicitly reference gender. Theorists Bloch and Lemish posit some reasons that the *Tamagotchi* [1] was universal in its success despite its initial market research towards girls. As a piece of technology, *Tamagotchi* [1] inherently “privileged traditional male technological skills” ([2], p.296), aligning with the prevailing belief in the 90s that boys were more likely to design, create,

and play software games than girls [2]. While software game players could be of any gender, the industry primarily targeted a male audience ([57], p.1). It is observed that the shift of understanding software games as “just for boys” has evolved with the growth of using mechanics such as love and care in gameplay ([5], p.90). *Tamagotchi* [1] is “neither a fuzzy animal nor a vehicle or a mechanical toy, neither a soft plastic doll nor a violent computer game” ([2], p.296). Kritt argues that the lack of clarity around *Tamagotchi* [1] and gender is insidious and purposeful. While the toy was designed with girls in mind, it did not explicitly state that it was only for girls. *Tamagotchi* [1] even arguably diminishes male–female differences “in technological immersion” [37]. However, they still promote traditional gender roles in that there is a knowledge that *more girls* than boys will play, and the main mode of play is to care and nurture [37,39].

The literature revealed a deeply cautious interpretation of what meaning a virtual pet construes when it is designed for girls [37,39]. The literature that recognizes *Tamagotchi* [1] as a toy originally designed for girls asserts that the success or failure (continued life or death of) a virtual pet can be seen as reflective of being a “good” or “bad” mother [39]. “The girl can never fully succeed because the pet’s and baby’s lifecycle is always brief” ([39], p.43). Too, there is a concern that virtual pets teach their “predominantly female owners” that “an emotionally meaningful relationship is simply care and dependence” ([37], p.83) where the role of the *mother* is simply to care for, and expect nothing in return. More modern games, such as the still-updating and live *Star Stable* [19] are both more explicit in their marketing towards girls and in the messages they then pass on to their players. In *Star Stable* [19], care is still very much a primary mechanic. However, the female avatar is given agency, and is the hero of her narrative within *Star Stable* [19]. This reflects a shift in how games for girls are being designed.

While the more male-targeted *DigiMon* [51] implements some care mechanics, the advertising stipulating its existence focuses on fighting and boxing [39]. Instead of care progressing growth, *DigiMon* [51] are grown through training and battle [39]. This stark distinction underscores how gaming mechanics continue to reinforce gendered expectations—where girls’ games emphasize care and relationships, and boys’ games prioritize power and competition.

The landscape of gender, toys, and video games is constantly shifting. The writing that specifically looks at the gendered marketing of virtual pets has only been published as recently as 2007 [58]. Recent years have shown significant increase in women playing video games [59]; yet games designed for women still tend to focus more on emotionality and care-taking than games designed for men [5], a trend partially mirrored with virtual pets. We will leave it to future work to further unpack gender and virtual pets.

3.5. Theme 5. Robots, virtual, real: Similarities and differences

Of the 45 texts, almost two thirds made references to real or soft toy creatures (N = 27). Of those, about a third compared virtual and real, a third compared virtual with soft toys or robots, and a third referenced both.

Comparisons of virtual, real, and toy pets led to a taxonomy of virtual pet players: (1) Those who play with virtual pets for “pet-keeping” enjoy animals, but cannot have a living creature as a pet due to personal circumstances; (2) “animal teammates” enjoy real creatures but enjoy the less restricted possibilities of what a virtual pet can do; (3) “cool hunters” are keen on collecting and “improving” virtual pets [60]. Like real pets, virtual pets can offer comfort, especially for younger users [61]. On the one hand, there was no evidence that the embodied robot *Aibo* dog provided more emotional comfort than the virtual *Nintendog*, challenging the assumption that robotic companions would naturally foster stronger emotional attachment due to their tangibility and resemblance to living creatures. On the other hand, the dependable soft toy dog may still be the superior friend for young children. When

asked to interpret whether a phrase such as “S/He always wants to play, even when I’m busy” related to a toy pug, *Nintendog* pug, or both, children aged 4 to 6 tended to choose the toy over the virtual dog, especially for phrases about loving connections [62]. The soft physicality mattered.

The literature cautions what virtual pets could mean for living pet animals. Are alive pets to be abandoned, having been bred out of the capability to perform successfully as a wild creature and surpassed in terms of companionship? The co-existence of real pets forces humanity to consider the “other”. For a designed virtual creature, this “otherness” is obscured because we can make it whatever we wish while an alive pet is still its own agent [34]. The portable nature of virtual pets like the *Tamagotchi* [1], combined with the ability to easily engage with them at any time, can make them a more explicit part of a person’s life compared to a real pet [33]. This is especially true given the direct, continuous interaction that is often required to keep a virtual pet “alive” and well. This level of interaction can make the virtual pet a constant part of one’s daily routine, unlike a real pet that might be left at home during the day or not require such constant attention. The designed intention of a virtual pet’s constant companionship has even interrupted learning—many schools banned *Tamagotchi* [1,33].

Virtual pets remain thematically and semiotically bound to real pets, robots, and soft toy animals. The literature suggests that virtual pets can be seen as another invention or design aimed at delivering the same, heightened, or varied satisfaction compared to what a living pet can offer. “Comparison” is key. It is difficult to discern here which is more desirable: The virtual creature, packaged and designed for us? Or the living pet, who has irrefutable needs embodied in soft fur and warmth? Virtual pets offer unique opportunities for play and companionship, particularly for people who cannot own real pets, but they also raise questions about emotional attachment, the nature of play, and ethical considerations related to the treatment of real animals.

3.6. Theme 6. Ethics: Is *Tamagotchi* today’s Satan?

Of the 45 texts, 8 include decidedly critical and cautionary stances towards virtual pets. Critiques related to capitalism and gender have been explored above while ethical and moral concerns are explored below.

Žižek posits the bold question in this theme title with an introduction of the concept of “interpassivity”—an antithesis of *interactivity*—a mode of existence wherein a person reduces their active engagement with the world, and allows an object to participate on their behalf. For example: canned laughter where the tv itself laughs at humor so “you” do not have to [36]. Žižek claims the *Tamagotchi* [1] is the ultimate device of interpassivity because it is software that simply and continuously tells a person what to do: feed, drink, clean and bathe the *tama* [36]. Left unattended, a child may steal another child’s *Tamagotchi* [1] and feed it in excess, an outcome that can literally choke the *tama* to virtual death [36]; Žižek calls this the “breeding” of “virtual murderers among children” and creating the “cyberspace counterpart” of “the sadistic child torturing a cat or a butterfly to death” ([36], p.144). Moreover, the *Tamagotchi* [1] has been the direct cause of nervous breakdowns and death [36,47].

While agreeing on the problems, others situate the cause within people rather than the virtual pets [47].

Is loving a virtual pet an example of “the technological erosion of emotion” [37]? The *tama* is technically “born” from an egg that hatches with the press of a button. From there, it progresses from infancy to adolescence and adulthood based on user input. The concern here lies in the potential abstraction or reduction of real-life experiences, as the user must actively perform specific actions to simulate the processes of “birth” and “raising”. The easy-by-comparison task of raising a *tama* may diminish the perceived value of authentic childbirth and parenting [37]. In a fieldwork study, a preschool teacher comments on a *Tamagotchi* [1]: “It is a bit cold, like a machine” ([63], p.507). With

the rise of urbanization literally blocking our view of the natural, human interest in living things is “perhaps becoming redirected towards human artifacts, with potentially grave consequences for biodiversity conservation” [47]. In a flashcard study, children were more able to recognize the *Pokémon* than real animal species implying that virtual animals be superimposing the spaces of our mind that may otherwise be concerned with environmental welfare [64]. The nature of the relationship is at play: pets “are actively and immensely loved” yet are also treated “like possessions” and “taunted, teased, ignored, neglected or cruelly abused” [47], which comes from our human tendency to derive “great pleasure in exercising power” [47]. While playthings may not be the optimal platform for humanistic discourse, virtual pets reinforce oversimplified narratives. What is meant to be an emotionally rewarding, bonding experience for (at least) two alive party members is reduced to a demanding toy. Co-operation or co-parenting is not encouraged in *Tamagotchi* [1,37]. Intricate and challenging components of raising and caring for another devolve into a demand-and-supply feedback loop. The user controls their pet with praise or scolding. Virtual pets serve to amplify “the underlying ideas on the cultural landscape” [37]. In the fieldwork, children claim to their teachers to enjoy the caregiving and responsibility, while actually spending time playing mini-games [63].

The concerns about the impact of virtual pets on users revolve around the potential regression of interpersonal relationships and emotions, the ethical implications of both designing virtual pets and how users interact with them, and the possibility of further diverting human attention from nature in favor of the virtual. Some texts imply that the design of the virtual pet itself is “damaging” [36], whereas others note that the virtual pet as a concept is neutral, and it is our engaging with the software(s) that load themes of positive or negative interaction onto the devices [47]. The concern of technology versus nature is not unfamiliar to many academic fields, and it is unsurprising to find the theme reoccur here [64].

4. Discussion

Our narrative review brings together cross disciplinary insights on the cultural significance of the prolific *Tamagotchi* [1] and other virtual pets. Heralded while despised, virtual pets are paradoxes of potential for nurturing healthy habits, learning, and companionship, while reviled for fueling unease by imitating “aliveness”, a modern take on Mary Shelley’s *Frankenstein* [65] and other cautionary tales of artificial intelligence gaining sentience (e.g., films such as Kubrick’s *Space Odyssey* [66] to the more recent *Ex Machina* [67]). Artificial, “alternative” and “non-natural” intelligences threaten and present ethical quandaries. The relationship between violence in games and violence in real life is contentious [68,69]; the worry that virtual pets foster abuse towards real animals remains. Themes around consumerism foreground immediacy, demand, and the larger conversation about the moral implications of purchasing animals for human amusement. There is a universal caution of our ability to have conversations with one another, suffering from our preference to interact with machines [70,71]. Since virtual pets are designed for their users, it is increasingly difficult to disengage from their companionship to seek human connection. This can be seen as another link in the chain of larger explorations surrounding video game addiction - a phenomenon serious enough to have its own medical definition and Anonymous support groups [72,73]. In the context of capitalist frameworks, the delineation between virtual and living pets becomes less pronounced as both are commodified for human gratification. Here the themes of gender and capitalism overlap: virtual pets tend to be targeted more towards girls than boys, with an emphasis placed on the role of “caretaker”. Nevertheless, certain virtual pet entities defy easy categorization, embodying paradoxical elements of care and aggression—where the latter is marketed more towards boys. Because virtual pets are effective in garnering emotional responses [54] and facilitating user-enhanced worlds of play [53], they

can become their own principle advocates in their own advertising. In the context of modern society where games are more collaboratively produced between company and player than ever before (with the utilization of collaborative monetization tools such as *Patreon* [74]), we speculate that this power will only increase. The ways in which virtual pets, primarily historically advertised as “for children”, can be marketed or able to push marketing, warrants further ethical investigation. The design decisions of including or excluding “death” in the design of a virtual pet also raises questions. Is it ethical to “kill” a virtual pet that is likely to belong to a child? Especially when we can design the creature to live forever and avoid the emotional pain? Is this perhaps a more palatable and humane way for children to first encounter death? Knowing the capacity for virtual pets to engender feelings of connection and companionship [54] further complicates these questions. Finally, virtual pets and their capabilities as agents are informed by the software that enables their existence. Whether on a stationary computer screen, a portable device, or a device that asks the user to physically move and perform, virtual pets are given different levels of “ability” to engender addiction and potentiate consumerism. This exploration becomes especially relevant as we recognize our own responsibilities as HCI researchers [75,76].

The wide dispersion of disciplinary writing on virtual pets may imply that they are difficult to categorize. This narrative review does not aim to resolve all of the mysteries of virtual pets. Still, the researchers acknowledge that they have pinpointed intriguing trends within the territory of virtual pets which hints at the importance and meaning of these creatures in our lives.

4.1. Limitations

This narrative review covered a relatively small pool of articles. While the topic of “virtual pet(s)” itself is arguably under-researched, this review may miss a portion of literature not written in English. The Western perspective held by the primary authors of this review come with fundamental biases and understandings of death, life and the role of pets in day-to-day living. While care has been taken to acknowledge this bias, the narrative review findings are affected by this perspective. We made the decision to include juried articles because (1) we wanted to widen the inclusion of as much academic thinking as possible and (2) to counter potential peer-review gatekeeping for work on virtual pets. This decision may have led to greater variable quality of scholarship.

Our query was limited to virtual pet software and games. The tangible embodiment of toys and robots such as p.507, [16] can play a large role in human relationships. Our canonical case of *Tamagotchi* [1] is at once central and an edge case, as it exists within a non-animal-shaped vessel. The deciding factor was the lack of resemblance the plastic egg casing has to the *tama* it holds. The egg of the *Tamagotchi* [1] offers portability and convenience. We further opted not to include “*Pokémon*” as a search term because it is a massive franchise and the volume of literature dedicated to *Pokémon* exceeds that of the sum of all other virtual pets, thus is more specialized and would not provide generalizable insights into the broad virtual pet landscape.

5. Conclusion

Through a process of charting literature across a wide range of disciplines, this scoping review has collated themes within the literature of virtual pets: spanning themes of virtual pets in the context of their simulated death and birth, virtual pets in the context of healthcare, discussions surrounding virtual pets and capitalism, virtual pets and gender, comparisons between virtual pets, real pets and toys, and a selection of articles discussing ethical concerns involving virtual pets. We draw implications for cultural significance and continued potentials of virtual pets (see Table 1).

Table 1

Author	Year	Journal/Conference/Series	Cluster	Selected tags
Aguiar [62]	2015	Cognitive Development	Health	Toys
Ahn [77]	2015	Journal of Health Communication	Health	AI, Habits, Relationships
Ahn [78]	2016	Cyberpsychology, Behavior, and Social Networking	Health	AI, Habits, Relationships
Allen [79]	2014	Intl Conf on Advanced Computer Science and Information System	HCI	Relationships
Allison [33]	2006	Millennial Monsters	HCI	Capitalism, Death, Realness, Relationships
Apperley [54]	2015	Game Love	HCI	Capitalism, Relationships, Teaching
Arvind [80]	2022	IEEE Healthcare Innovations and Point of Care Technologies	Health	Habits, Helping
Balmford [64]	2022	Science	HCI	Gender, Realness, Technophobia
Bloch [2]	1999	New Media and Society	HCI	Birth, Capitalism, Death, Relationships, Toys
Bunt [42]	2020	Smart Learning Environments	AI	AI, Teaching
Bylieva [12]	2020	Digital Science	HCI	AI, Birth, Death, Habits, Helping, Realness, Teaching, Toys
Chahyana [81]	2020	Journal of Physics	HCI	Helping, Realness
Chai [82]	2021	Intl Conf on Multimedia in Asia	Health	Age, Habits, Helping
Chen [83]	2016	British Journal of Educational Technology	HCI	Age, Habits, Helping, Teaching
Chesney [58]	2007	Interaction Studies	AI	AI, Realness, Relationships
Chi [44]	2017	Geriatric Nursing	AI	Age, AI, Helping, Relationships
Collins [84]	2018	Audio Mostly: Sound in Immersion and Emotion	HCI	Death, Relationships
Donath [9]	2004	Encyclopedia of Animal Behaviour	AI	AI, Death, Realness, Relationships
Dorin [85]	2004	Artificial Life	AI	AI, Death, Relationships, Toys
Fujinami [86]	2019	IEEE Intl Conf Pervasive Computing and Comms Workshops	HCI	Habits, Learning, Relationships
Giddings [87]	2019	Studies in Childhood and Youth	AI	Age, AI, Capitalism, Relationship, Toys
Johnsen [40]	2014	IEEE Trans Visualization and Computer Graphics	Health	Age, AI, Helping, Relationship, Realness
Kaplan [10]	2000	Edutainment Robotics Workshop	AI	AI, Death, Toys
Kritt [37]	2000	ournal of American and Comparative Cultures	HCI	AI, Birth, Death, Gender, Realness, Relationship, Technophobia
Kusahara [13]	2001	Leonardo	AI	AI, Death, Realness, Relationship, Toys
Laureano-Cruces [88]	2012	Journal of Ambient Intelligence and Humanized Computing	Health	Age, Death, Habits, Relationship, Teaching, Toys
Lawson [61]	2007	Intl Conf on Information Visualisation	HCI	Age, Capitalism, Realness, Toys
Li [89]	2011	Dept of Industrial Design	HCI	Age, Realness, Relationship, Toys
Li [90]	2017	Design, User Experience, and Usability: Designing Pleasurable Experiences	HCI	Age, Helping, Relationship, Teaching
Liang [91]	2021	Conf on Human Factors in Computing Systems	HCI	Age, AI, Realness
Lin [92]	2017	Intl Conf on Affective Computing and Intelligent Interaction	AI	Age, AI, Helping, Realness, Toys
Lin [60]	2017	Symposium on Virtual Reality Software and Technology	HCI	Age, Helping, Realness, Relationship
Lin [41]	2006	Intl Conf on Ubiquitous Computing	HCI	Age, Habits
Nakajima [93]	2020	Intl Conf on Human-Agent Interaction	Health	AI, Health, Helping, Realness
O'Rourke [34]	1998	Animal Issues	HCI	Age, AI, Birth, Death, Realness, Technophobia
Rault [94]	2015	Frontiers in Veterinary Science	HCI	Relationship, Realness, Toys
Ruckenstein [63]	2010	Childhood	HCI	Age, Capitalism, Technophobia, Toys
Ruckenstein [52]	2015	Journal of Consumer Culture	HCI	Age, Capitalism, Technophobia, Toys
Teruelle [53]	2011	Teaching and Learning	HCI	Age, Capitalism, Helping, Teaching, Technophobia
Tsai [14]	2008	PhD Thesis Simon Fraser University	Health	Age, Realness, Relationship, Teaching
Visscher [95]	2020	Symposium on Computer-Human Interaction in Play	Health	Helping, Relationship
White [39]	2002	Canadian Children's Literature	HCI	Age, Birth, Capitalism, Death, Gender, Relationship, Technophobia
Wrye [47]	2009	Canadian Journal of Sociology	HCI	AI, Capitalism, Realness, Relationship, Technophobia, Toys
Yoon [96]	2000	Conf on AI and Conf Innovative Applications of AI	AI	AI, Realness
Žižek [36]	1998	Historical Materialism	HCI	Age, Death, Technophobia

CRediT authorship contribution statement

Michaela Dodd: Writing – review & editing, Writing – original draft, Methodology, Investigation. **Allan Fowler:** Writing – review & editing, Supervision, Conceptualization. **Danielle Lottridge:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We thank the *Entertainment Computing* reviewers for their thorough and diligent feedback to help us create the strongest narrative review possible. Special thanks to Tienie the dog and Helen the cat for inspiring us with real wagging tails and loud purrs to explore the world of virtual pets. During the preparation of this work the author(s) used *ChatGPT: Language Model* [97] in order to refine certain sections of writing or evaluate writing cohesion. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Data availability

Data will be made available on request.

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