

The Rise and Benefits of Companion Robots

Increased studies convey the unique benefits of robotic pets like Sony's aibo

ADVERTISEMENT – This article and research was funded by Sony Electronics Inc.



4 Saint Gabrielle Court
Tiburon, CA, 94920-1619
+1 415 435 9368
www.jonpeddie.com



© Copyright Jon Peddie Research 2021. All rights reserved.

Reproduction in whole or in part is prohibited without written permission
from Jon Peddie Research.

This report is the property of Jon Peddie Research (JPR) and made available to a restricted number of clients only upon these terms and conditions.

Agreement not to copy or disclose. This report and all future reports or other materials provided by JPR pursuant to this subscription (collectively, “Reports”) are protected by: (i) federal copyright, pursuant to the Copyright Act of 1976; and (ii) the nondisclosure provisions set forth immediately following.

License, exclusive use, and agreement not to disclose. Reports are the trade secret property exclusively of JPR and are made available to a restricted number of clients, for their exclusive use and only upon the following terms and conditions. JPR grants site-wide license to read and utilize the information in the Reports, exclusively to the initial subscriber to the Reports, its subsidiaries, divisions, and employees (collectively, “Subscriber”). The Reports shall, at all times, be treated by Subscriber as proprietary and confidential documents, for internal use only. Subscriber agrees that it will not reproduce for or share any of the material in the Reports (“Material”) with any entity or individual other than Subscriber (“Shared Third Party”) (collectively, “Share” or “Sharing”), without the advance written permission of JPR.

Subscriber shall be liable for any breach of this agreement and shall be subject to cancellation of its subscription to Reports. Without limiting this liability, Subscriber shall be liable for any damages suffered by JPR as a result of any Sharing of any Material, without advance written permission of JPR.

Important Note re Sharing of Material. If Subscriber wishes to Share any Material with any Shared Third Party, it shall contact JPR and request permission to do so. JPR shall forthwith prepare an appropriate Sharing agreement, which shall set forth the name and contact information of the Shared Third Party, the terms and conditions of such Sharing, the compensation to JPR for such Sharing, and the agreement by Subscriber and the Shared Third Party that the Shared Third Party shall not, under any circumstances, Share any of the Material with any other entity or person.

Disclaimers. JPR Reports contain “reviews” of various products and information. The content of these Reports represents the interpretation and analysis of statistics and information that are either generally available to the public or released by entities or individuals deemed responsible. The information in the Reports is believed to be reliable but is not guaranteed as to its accuracy or completeness. The Reports do not endorse or attempt to sell any products and should not be interpreted differently. JPR assumes no responsibility for the correct or incorrect usage of any trademarks or service marks.

Table of contents

The Rise and Benefits of Companion Robots.....	1
Introduction.....	4
Health and Physical Benefits	4
Overcoming Loneliness	5
Improved Learning and Self-Reliance	6
Increased Sociability and Self-Esteem.....	7
Appendix.....	9
References.....	9
Index	11

Table of figures

Figure 1: aibo will pick up toys, dance, and take your picture (Image Sony)	7
---	---

Introduction

Companion robots have been with us for over a decade, yet are not that well known. One reason is the misunderstanding of what a robot is and isn't. And part of that is due to the term robot itself, and its portrayal in film and books. A friendlier term is animatron, android, or social-robot, sometimes called "socialbots."

A specific class of socialbots are made to resemble animals, and they're often referred to as "robopets." Some of today's robopet companions are super smart, independent creatures. They know where they are in the world, they have eyes and ears, and they can feel someone touching them. They roam independently and with a purpose. They even bark and play.

Sony began developing such creatures in the mid-1990s and in 1999 introduced aibo™, the world's first robotic pet. It was a product of its time and was by today's standards somewhat limited. But it established the concept—technology would catch up. Sensors got better (Sony is a leader in the sensor field), and AI got more efficient and accessible through the cloud.

In the late 1990s, Sony wanted to introduce people to robots and living with robots. They began working on social and companion robot concepts—socialbots and robotic pets. Over the years, at its Computer Science Laboratory (CSL) think tank Sony experimented with and produced companion and entertainment bots.

AIBO—an acronym for Artificial Intelligence robot—meaning in Japanese language "friend," "pal," or "companion" (www.sony.com).

The concept of socialbots goes back even further. Introduced in Japan as part of the Kansei engineering philosophy, introduced in the 70s it has become widespread as companies sought to improve design by taking the consumer's emotional responses into consideration. The design was improved as researchers learned more about people's reactions to the devices and their expectations of a robopet—it has to be able to interact appropriately with people.

Robopets have three key dimensions which are vital factors for human-robot interaction (HRI)¹: anthropomorphism, emotion, and personality.²

Overall enjoyment is higher and more positive emotions are reported following interaction with a robopet. And as people attached animal-like characteristics to the robopet, the more they enjoyed the experience and relationship. This showed that people's emotions were an important element in their appraisals of the robopets.³

Health and Physical Benefits

The connection people develop with their pets has evolved and strengthened over the centuries.⁴ Most pet owners think of their animals as members of the family. They see the pets as of equal importance to other people in the household. And it's been established that there are health benefits to this connection, this bond. Those attributes including a decrease in blood pressure, cholesterol, and triglyceride levels. Pets have been used in therapy for children with ADHD.⁵ Although robopets are not pets *per se*, their value to their owners is being established as these companions enter society. One study found robopets evoke a form of a social relationship that

involves companionship.⁶ Anecdotal evidence suggests they may contribute to people's health and quality of life. They may even contribute to healing from serious illnesses and depression. Aibo requires interaction so this can help people who are able to interact with the robot and clinicians have reported positive changes in the owner's behavior.⁷

A study in the Journal of Alzheimer's Disease showed that dementia patients who engaged in therapy with a robopet displayed decreased stress, lower anxiety, and reduced medication use over a three-month period. The results showed a 6.8% reduction in antidepressants and 10% reduction in pain medications.⁸

Research has shown petting and talking with a companion animal can lower stress levels and help people relax—people of all ages. The Center for Disease Control and Prevention (CDC) has pointed out that have shown that the bond between people and their pets can increase fitness, lower stress, and bring happiness to their owners. Some of the health benefits of having a pet include decreased blood pressure, cholesterol levels, triglyceride levels, and feelings of loneliness. However, live pets can sometimes carry harmful germs that can make us sick even when the pet appears healthy.⁹ A robopet brings the benefits without the risks. The CDC also says pets can teach children compassion and responsibility. However, children 5 years of age and younger should be supervised while interacting with animals to ensure the safety of the child and the pet. A robopet doesn't present that risk.

There are lots of positives to using a robotic animal over a therapy dog. They can be thoroughly cleaned and can work for longer periods of time. They can also be incredibly lifelike, mirroring the movements and behavior of a real animal, such as wagging their tails to show excitement, expressing "emotions" through sounds and color, turning their ears towards sounds and even going to sleep.

One way to ameliorate the welfare concerns associated with pet dogs and therapy dogs is the use of social robots in Robot Assisted Interventions (RAI). Like AAI (Animal Assisted Interventions), the aim is to increase human health and psychological wellbeing. Robotic animals could be the 'pawfect' replacement for our real-life furry friends, according to a study in 2020.¹⁰

In addition, these pets offer very practical solutions for those with allergies or in a nursing home who simply cannot own a real-life pet.

Overcoming Loneliness

Loneliness has been rising in society, particularly among the elderly population especially over the past year during COVID. Various studies have reported that residents in nursing homes experience a sense of joy, smile, and interact with others more when pets are present.

New York State Office for the Aging director, Greg Olsen, said many people who are in his program cry when they receive the robotic pets—they love them like a real pet—and their families and caregivers have said they see a huge difference in their loved one's mood.¹¹

Perhaps robopets like aibo that are capable of responding directly to people in pet-like ways can supply positive feedback. Researchers discovered at the University of Auckland in New Zealand

that a robopets offer comfort and companionship to senior adults that is similar to that of a living animal.¹² The researchers compared how each group scored on the tests before and after the 12-week period, the investigators found that loneliness scores decreased in the robopet group, but increased in the control group. With real animals, residents were unable to talk to or touch the dog because the dog could choose who it interacted with, whereas the robot could be put on the lap of all residents and would respond to them.

Other research with youngsters found that interaction with live therapy dogs was calming and enjoyable for the children. As a result, researchers wanted to find out if robopets could produce similar outcomes. In a study of 11–12-year old children in the UK, the researchers employed a therapy dog and a robopet dog.¹³

It was discovered that the children spent a similar amount of time engaging in positive social touch with the robopet and the therapy dog, but overall, the children spent more time interacting with the robopet. This may be because the robopet was more responsive to the children's initiation behaviors. In addition to the positive effect the robopet dogs had on the children, the researchers also pointed out that robopets may be advantageous in that they can be thoroughly cleaned, are able to work for longer periods of time, and may be more cost effective.

Similarly, a study showed interactive robotic dogs can reduce loneliness in residents of long-term care facilities and that residents become attached to these robots.¹⁴

Aibo has been used in several animal-assisted therapy studies, but aibo isn't the only one. There are several other companion robots that have been used in studies to showcase the benefits that robotic pets can bring to humans.

Improved Learning and Self-Reliance

Robopets can help children develop greater empathy and higher self-esteem and increase their participation in social activities. Other service and support robopets offer similar benefits by providing their owners with more autonomy.

Several investigations have shown that when people assign emotional feelings and personality characteristics to animals, it leads to cooperation and communication—crucial for designing robopets.

Early research into children's behavior toward a robopet vs. a live pet showed similarities suggesting children develop feelings of respect for, and comfort from either a live pet or a robopet.¹⁵ Other research studies have come to similar conclusions that suggest that playing with and caring for a virtual pet dog may promote empathy and humane attitudes.¹⁶

An increasing body of research evidence now appears to support the view that pets and, in particular, robopets, act as agents of health promotion. People who own pets, and who form a bond with that pet, benefit in terms of better physical, mental and social well-being, when compared with non-pet owners.¹⁷

Companion robots for children are gradually finding their way into different areas of people's lives, often in ways that improve children's experiences or help them develop useful skills.¹⁸

Increased Sociability and Self-Esteem

Pets are companions and provide their human partners enjoyment too. Having a pet to play with is one of the joys that comes with a pet, and pets appreciate their human partners. aibo is similar and likes praise, a rub on the head, chin and back. aibo also likes, and responds to positive verbal feedback, such as “You’re a good boy,” With a chirpy little bark, or a tilt of his head, and maybe a paw lift.

Robopets like aibo tap into our desire for affection by encouraging us to play and hold them.

¹⁹Aibo approaches people and appears to sniff at them, yap at them or mimic the bobbing of the head that real dogs use to invite others to play.

Aibo demonstrates how robopets have the ability to comfort us and connect us to new experiences. It gives us a glimpse of how robots can manipulate us in ways we’ve not quite encountered before, with positive results. ²⁰

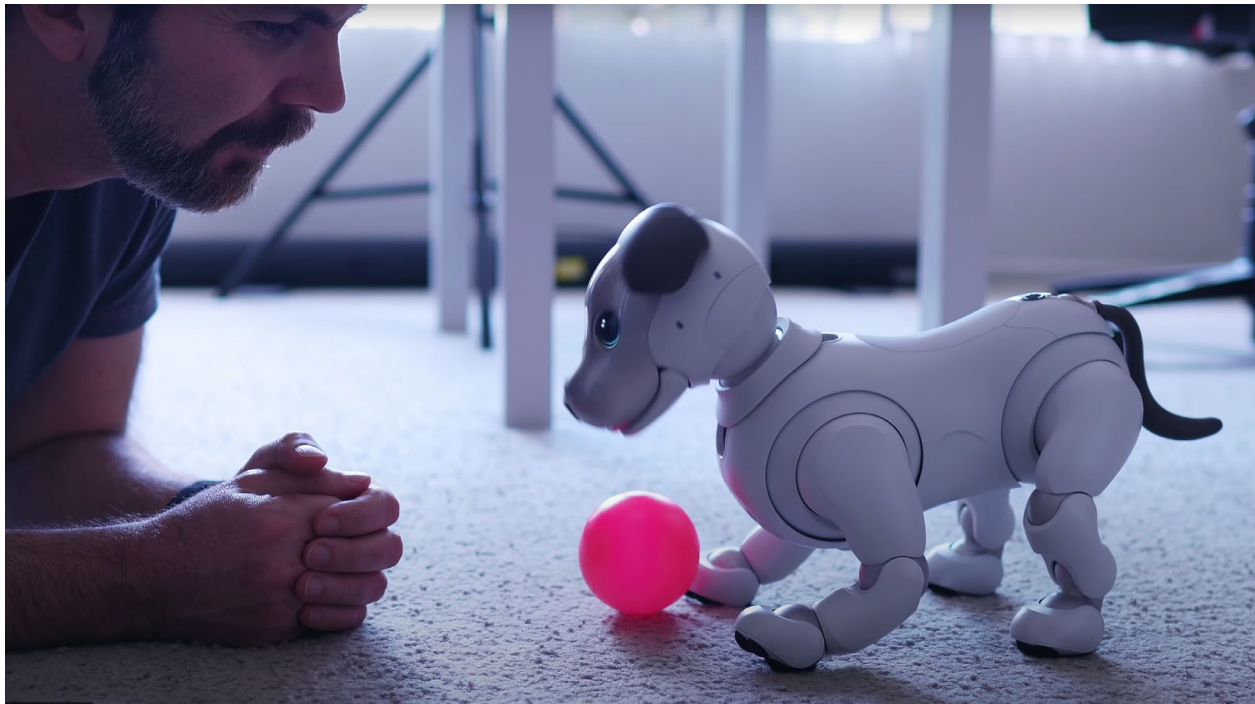


Figure 1: aibo will pick up toys, dance, and take your picture (Image Sony)

With an aibo AI Cloud Plan¹ owners can teach aibo tricks and aibo can be taught to respond to voice commands (which it does not record). There are cameras and sensors in aibo’s head and chest that helps the robopet sense nearby people and objects. Using the camera near its tail to see the ceiling aibo can map the layout of one’s home. aibo can also learn about its specially designed toys, and most importantly, its charging station. so over time he learns how to get around. Steps however are challenging, aibo’s brain is in the cloud and as part of that AI, aibo

¹ aibo and aibo AI Cloud Plan subscription required to fully enjoy all features of "My aibo." App. Subscription and major credit card required. Cancel before trial period ends to avoid monthly fee

can be unpredictable, much like a real pet, and at times it seems to have a will of his own. Sony says a bit of unpredictability is by design. It makes people pay attention to how their aibo responds, but it will make a huge difference if future generations can respond (or not respond) much more quickly.

Robopets provide unconditional love and emotional support and are more manageable than real dogs which is why they appeal to young children, families who want a pet, and elderly or disabled people. People have always loved their dogs and had a strong relationship with them. If the basic behaviors can be mimicked by a robopet— attentiveness, happiness, love, and pleasure by being petted or patted, emotive beings that we are could be convinced into thinking that we are experiencing something real It's not that much different than loving an inanimate stuffed animal. On the other end of the spectrum, trainable robopets and programmable robots teach children to understand machine human interaction, which is likely to become valuable in an era of machine assisted living.

Promising the best of both worlds, studies have shown that people form real emotional bonds with robopets and keep them intellectually engaged, and this unique space is where aibo lives and excels.



Summary

An increasing body of research supports the view that pets and, in particular, companion pets, act as agents of health promotion, improved learning, sociability, and increased self-esteem.

However, it is not always practical or possible to have a live companion pet. For over two decades companion robots, have been used to help people. Studies have shown that people of all ages have not only accepted robotic pets as desirable companions but have flourished with them.

The technology behind these new robotic pets is nothing less than astonishing with a variety of sophisticated sensors for touch, sight, hearing and, location. The power of artificial intelligence to help the robotic pets learn new tricks and the characteristics of their owners brings an amazing sense of realism causing a suspension of disbelief and creating acceptance and affection similar to that felt with live pets.

These are the early days of living with robots, and if you or one of your friends have one it is viewed with curiosity and as a novelty—just as TV was in the 1930s, and horseless carriages before that. But, in a decade these robots may be as commonplace in a person's home as a TV is now. And as many observers and writers have pointed out you don't to feed them, walk them, or clean up after them.

Appendix

People are living longer in the industrialized countries, especially in Western Europe, the US, and Japan. In many cases, they are also living more isolated lives, which is exacerbated by the pandemic. Pets have proved to be wonderful loving companions for lonely and elderly people, but pets require care and that can be burdensome. Also, they may not be allowed in some apartment buildings or group living places.

Animatronics—animated electronics are animal-simulating-electrical-mechanical machines, It can be a part of a robot or not. Robots by nature do not imitate humans but do the work of humans. Animatronics are limited in that they will imitate humans or animals. While a robot is an automatic, programmed or artificial intelligence-based machine, it can be used for many purposes.

References

¹ Steinfeld, Aaron; Fong, Terrence; Kaber, David; Lewis, Michael; Scholtz, Jean; Schultz, Alan; Goodrich, Michael, *Common Metrics for Human-Robot Interaction*, Association for Computing Machinery (March, 2006),

<https://apps.dtic.mil/sti/pdfs/ADA633755.pdf>

² Fong, T., Nourbakhsh, I., and Dautenhahn, K. *A survey of socially interactive robots*. Robotics and Autonomous Systems, 42 (2003). <https://www.cs.cmu.edu/~illah/PAPERS/socialroboticssurvey.pdf>

³ Wollweton, Megan, *Loving a robot dog is about so much more than not cleaning up poop*, (July 2019), <https://www.cnet.com/features/loving-a-robot-dog-is-about-so-much-more-than-not-cleaning-up-poop/>

-
- ⁴ Lenhard, Emily N., The Human-Animal Bond throughout Time, College of Veterinary Medicine, Michigan State University (December 2018), <https://cvm.msu.edu/news/perspectives-magazine/perspectives-fall-2018/the-human-animal-bond-throughout-time>
- ⁵ Schuck, Sabrina E. B., et al, Canine-Assisted Therapy for Children With ADHD: Preliminary Findings From The Positive Assertive Cooperative Kids Study, PMC, US National Library of Medicine, National Institute of Health, (February 2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4348044>
- ⁶ Friedman, Batya, et al, Hardware Companions? –What Online AIBO Discussion Forums Reveal about the Human-Robotic Relationship, Digital Sociability, HI '03: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, (April 2003), <https://dl.acm.org/doi/10.1145/642611.642660>
- ⁷ Abbott, Rebecca, et al, *How do “robopets” impact the health and well-being of residents in care homes? A systematic review of qualitative and quantitative evidence*, International Journal of Older People Nursing Published by John Wiley & Sons Ltd. (May 2019), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6766882/>
- ⁸ Hirt, Julian; Nicola Ballhausen, Hering, Alexandra; Kliegel, Matthias; Beer, Thomas; and Meyer, Gabriele (Handling Associate Editor: Rebecca Palm), *Social Robot Interventions for People with Dementia: A Systematic Review on Effects and Quality of Reporting*, Journal of Alzheimer’s Disease, Volume 79, Number 2, 2021, Pages 773-792, <https://www.j-alz.com/vol79-2>
- ⁹ *About Pets & People*, <https://www.cdc.gov/healthypets/health-benefits/index.html>
- ¹⁰ Barber, Olivia; Somogyi, Eszter; McBride, Anne E; and Proops, Leanne, *Children’s Evaluations of a Therapy Dog and Biomimetic Robot: Influences of Animistic Beliefs and Social Interaction*. International Journal of Social Robotics, (December, 2020) Springer Link ; DOI: 10.1007/s12369-020-00722-0, <https://link.springer.com/article/10.1007/s12369-020-00722-0>
- ¹¹ Lowrey, Sassafras, *Robot Dogs Can Help Seniors Cope—Especially During Covid*, (October 2020), <https://www.wired.com/story/robot-dogs-therapy-pets-seniors/>
- ¹² Robinson, Hayley; MacDonald, Bruce; Kerse, Ngaire; Broadbent, Elizabeth; *The Psychosocial Effects of a Companion Robot: A Randomized Controlled Trial*, Journal of the American Medical Directors Association, Volume 14, Issue (9, September 2013), Pages 661-667, <https://www.sciencedirect.com/science/article/abs/pii/S1525861013000972>
- ¹³ Barber, Olivia; Somogyi, Eszter; McBride, Anne E. & Proops, Leanne, *Children’s Evaluations of a Therapy Dog and Biomimetic Robot: Influences of Animistic Beliefs and Social Interaction*, International Journal of Social Robotics (December, 2020), <https://link.springer.com/article/10.1007/s12369-020-00722-0>
- ¹⁴ Banks, Marian R; Willoughby, Lisa M; Banks, William A, *Animal-assisted therapy and loneliness in nursing homes: use of robotic versus living dogs*, J Am Med Dir Assoc. (2008), <https://pubmed.ncbi.nlm.nih.gov/18294600/>
- ¹⁵ Melson, Gail F. et al, *Children’s behavior toward and understanding of robotic and living dogs*, Journal of Applied Developmental Psychology, (November 2008), https://faculty.washington.edu/pkahn/articles/robotic_dogs.pdf
- ¹⁶ Tsai, Yueh-Feng (Lily), *The effects of interacting with a Computer-simulated virtual pet dog On children’s Empathy and humane attitudes*, Simon Fraser University Ph.D thesis, (Summer 2008), https://www.collectionscanada.gc.ca/obj/thesescanada/vol2/002/NR58498.PDF?oclc_number=753222618
- ¹⁷ Eachus, Peter, *Pets, people and robots: The role of companion animals and robopets in the promotion of health and well-being*, International Journal of Health Promotion and Education, (March 2014), <https://www.tandfonline.com/doi/abs/10.1080/14635240.2001.10806140>
- ¹⁸ Pearson, Yvette, *Child-Robot Interaction*, American Scientist (Jan-Feb 2020), <https://www.americanscientist.org/article/child-robot-interaction#>
- ¹⁹ Baggaley, Kate, *New companion robots can’t do much but make us love them*, <https://www.nbcnews.com/mach/science/new-companion-robots-can-t-do-much-make-us-love-ncna1015986> (June 23, 2019)
- ²⁰ Fowler, Geoffrey A., *Aibo the robot dog will melt your heart with mechanical precision*, Washington Post, <https://www.washingtonpost.com/technology/2018/09/18/aibo-robot-dog-will-melt-your-heart-with-mechanical-precision/>

Index

Computer Science Laboratory (CSL), 4
human–robot interaction (HRI), 4

Olsen, Greg, 5
robopets, Companion, 4