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<https://doi.org/10.31287/FT.en.2025.10>

Article published: 30th June 2025

Robots or Paws in Service? Lessons from an Inclusive Research Journey by a Dog Owner with Disability



2025/1
HUNGARIAN JOURNAL OF DISABILITY STUDIES & SPECIAL EDUCATION

Abstract

Based on the author's personal experiences and research findings, this study introduces the principle of "Nothing About Us Without Us!" and emphasizes the importance of inclusive approaches in the training and use of service dogs. The study proposes a multidisciplinary development as a solution to the service dog versus service robot dilemma. By leveraging technology, "technology-empowered service dogs" are positioned to significantly enhance the well-being of individuals with disabilities. The study highlights the participatory nature of this development, demonstrating how novel and truly usable solutions can be achieved through collaboration with service dog owners. A service dog supported by technology can outperform service robots in tasks that were previously considered their forte. In this "high-tech" project, which focuses on special needs education and technological innovation, not only technical and special needs professionals but also service dog trainers and service dog owners play crucial roles.

Keywords: participatory/emancipatory approach, inclusive lifestyle in a barrier-free society, health triangle, object-finding smart collar for service dogs, multidisciplinary participatory development

Robotok vagy mancsok a szolgálatban? Egy fogyatékossgal élő gazda inkluzív kutatásának tanulságai

Absztrakt

A szerző személyes tapasztalatai, kutatási eredményei alapján bemutatja a „Semmit rólunk nélkülünk!” elv és az inkluzív szemléletmód érvényesülését segítő kutyák képzése és alkalmazása során. Egy multidiszciplináris fejlesztést tárgyal, melyben – a segítő kutyá vs. segítő robot dilemma feloldásaként – a „technológiával támogatott segítő kutyá” versenyképesnek bizonyul fogyatékossgal élő személyek „jólétének” javítására. A „tárgykereső okosnyakörv” fejlesztés részvételi jellegének kidomborításával arra világít rá, hogy segítő kutyá-gazdák közreműködésével miért/hogyan lehet újszerű, valóban használható megoldásokra jutni. Egy technológiával támogatott segítő kutyá olyan feladatokat is jobban teljesíthet, amelyekben a segítő robotok eddig legyőzhetetlennek tűntek. A gyógypedagógiai célzatú, de technológiai innovációt is tartalmazó („high-tech”) projekt megvalósításában – a műszaki, gyógypedagógus, segítő kutyá-kiképző szakemberek mellett a segítő kutyá-gazdák is kulcsszereplők.

Kulcsszavak: partícipatív/emancipatív szemléletmód, inkluzív életvitel akadálymentes társadalomban, egészségügyi háromszög, tárgykereső okosnyakörv segítő kutyáknak, multidiszciplináris részvételi fejlesztés

Robots or Paws in Service? Lessons from an Inclusive Research Journey by a Dog Owner with Disability

My Motivations

I was born with a severe hearing impairment. Thanks to the long-term efforts of my family, special education teachers, and other educators, I learned to lip-read and speak, making the most of my minimal residual hearing. For almost two decades, qualified hearing dogs have made my everyday life easier, especially when I'm not wearing my hearing aid (e.g., at night). I am a multigenerational service dog owner and have, unfortunately, experienced the loss of my first hearing dog, Kuku.

My involvement in the world of service dogs has significantly influenced my career choice. I have always been interested in issues related to the social integration of people with disabilities, investigating ways to enhance their inclusive lifestyle. For example, I have explored the attitudes of schoolchildren towards their peers with special educational needs and the effectiveness of awareness-raising programs involving service dogs (Loványi & Perlusz, 2016).

I authored the storybook *Kuku and his Friends – Let's Get to Know the World of Service Dogs Together!* which aims to introduce young children to the world of guide, hearing assistance, mobility assistance, autistic assistance, and therapy dogs, as well as the everyday lives of their owners with disabilities (Loványi, 2015). As a university teacher, I emphasize the potential of service dogs in my lectures.

After completing my studies in special education and sociology, I obtained a habilitation dog trainer qualification. This allowed me to learn from experienced dog trainers and observe the transformation of puppies and family pets into service dogs, as well as the examination process. I see it daily how service dogs can promote the social integration of their owners by providing mental and physical assistance, in addition to other aids (e.g., hearing aids, wheelchairs). However, there is limited evidence-based research on the impact of service dogs in Hungary (Loványi, 2020).

The principle of "Nothing About Us Without Us!" and the rise of inclusive research methodologies support the collaborative work of disabled and non-disabled partners. When disabled individuals participate as partners, the research is considered participatory. In emancipatory research, professionals with disabilities and appropriate qualifications manage and lead the entire process. Since these trends emphasize personal experiences, I will refer to my own throughout this study (Loványi, 2020; Wickenden & Lopez Franco, 2021).



The History of Service Dogs – A Brief Review

Service dogs have long played a vital role in enhancing the everyday lives of their owners with disabilities. The history of domesticated animals is estimated to be at least 10,000 years old. Over this time, dogs have evolved genetically alongside humans, with cooperation benefiting both parties: dogs received consistent food and warmth, while humans gained more successful hunting outcomes and enhanced guarding and protective functions. The exact origins of the relationship between humans and dogs are lost in the mists of time, but the mutual experience of cooperation likely contributed to this special bond.

Dogs have remained social creatures ever since. The need for coexistence and cooperation is still embedded in modern humans, although the original version of this “program” in their mind is no longer necessary for survival. Visual depictions of dogs helping humans, such as military dogs, are as old as recorded history, with the beginning of cooperation dating back to prehistoric times. Fast forward to today: pets live in half of all households in Western societies, making this more the norm than the exception. The spread of service dogs is built upon this broad social base.

Traditionally trained service dogs continue to assist in much the same way as they did in ancient times. For example, guide dogs have been depicted on Roman frescoes (Loványi, 2022; Cohen, 2018). Now, let's delve into the more specific topic of this study.

The Expanded Understanding of the Role of Service Dogs in a Barrier-Free Society

In Figure 1, I summarize the complex positive effects of service dogs on “well-being” – based on my personal experiences and research (e.g., Loványi, 2020).

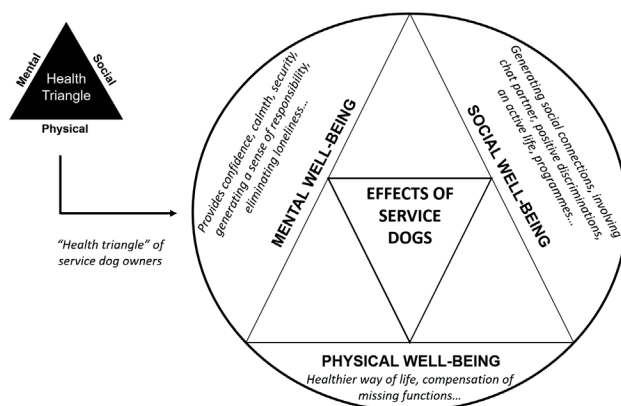


FIGURE 1. A NEW DIMENSION OF WELL-BEING: THE ROLE OF SERVICE DOGS IN MENTAL, SOCIAL, AND PHYSICAL HEALTH (RECONCEPTUALIZED WELL-BEING TRIANGLE PROPOSED BY THE AUTHOR)

Physical health refers to activities such as exercise, which the service dog can motivate its owner to do since the dog must be taken for walks regularly. The service dog provides a framework for the day, helping its owner to eat the right food at the right time and consciously incorporate rest. By providing physical assistance, the four-legged companion plays a major role in compensating for the owner's lost functions. Additionally, a specially trained dog contributes to **psychological/mental well-being**: a new world opens up for the owner as they learn and seek out new information. Taking care of the dog instills a sense of responsibility and confidence, and the dog's calming effect improves stress management. Socially, service dogs facilitate interactions, even on the street or among other owners and trainers. Thus, service dogs provide crucial support to their owners across all three sides of the health triangle (Loványi, 2022).

The Situation of People with Disabilities in an Accessible Society



The more aspects and social circles become “barrier-free” in a country, the more successful it can be overall. This success is reflected not only in the well-being of its citizens but also in its performance according to global economic, environmental, and social benchmarks. One explanation for this could be that performing most everyday tasks efficiently requires not only basic skills but also a high level of motivation from disadvantaged groups. Many people with disabilities can mobilize above-average motivation in favorable inclusive situations (Loványi, 2020; 2022).

Adhering to the “Nothing About Us Without Us!” principle is essential. However, addressing the latest challenges affecting well-being (e.g., the COVID pandemic, AI integration into daily life) solely from the perspective of people with disabilities or only considering the majority society's aspects would be a mistake. These new challenges can simultaneously create opportunities and dangers for people with different disabilities that may not be recognized by the majority society. Thus, both people with disabilities and the majority society must actively promote equal opportunities and inclusion. For example, through my voluntary association work – in the spirit of the “Nothing About Us Without Us!” principle – I successfully improved the acceptance of diversity with awareness-raising programs in kindergartens, schools, and workplaces involving service dogs (Loványi & Perlusz, 2016; Loványi, 2020).

The accessibility of society (ensuring access to opportunities, services, and information) can be hindered if the establishment and implementation of applicable laws fall under the exclusive competence of decision-makers who may not properly assess the needs of people with disabilities and/or may harbor negative prejudices. This is why it is important to start forming social attitudes with institutionalized solutions aimed at the youngest age group. The latest products of the “digital revolution” can help (or even threaten) the lives of various societal groups, including disabled and elderly individuals. Much of my work has involved awareness-raising projects starting at an early age in kindergartens. I have always advocated for the up-to-date codification and enforcement of equal opportunity laws. Equally important is ensuring the formation of positive attitudes in fledgling AI towards disabled and

elderly people – otherwise, the prejudices present in the majority society will inevitably appear in AI's "mindset". Additionally, including affected professionals with disabilities in legislation that aims to control AI's effects is absolutely necessary.

Extension of Service Dogs' Skills with a Task-Specific Portable Device and Training

1. During the training of my first hearing dog, digital aids with increasingly complex functions began to appear. These aids enabled remote unidirectional monitoring, influencing, and rewarding the behavior of (service) dogs (e.g., light-up collar, controlling a dog with a network camera, electronic feeding machine). Similar devices can support the life and work of trained service dogs, especially when problems or obstacles arise in coexistence with a disabled owner.
2. Making bidirectional communication and interaction between owner and service dog more efficient with portable smart devices, such as in the FIDO (Facilitating Interactions for Dogs with Occupations) project (Jackson et al., 2013), was a significant step forward. Not only could the owner initiate communication, but the dog could also do so by being trained to use their portable smart devices.
3. The interaction scheme in Figure 2 was implemented by a distributed device called the "object-finder smart collar", the need for which crystallized during our service dog training work at the NEO Hungarian Service Dog Association in the early 2010s. The technical implementation was completed a few years later in cooperation with the Budapest University of Technology and Economics (joint consultation of student theses and individual laboratory tasks). We used affordable RFID devices in a novel indoor 3D localization application, dividing the system elements between (1) the owner, (2) the dog, and (3) the environment/objects.

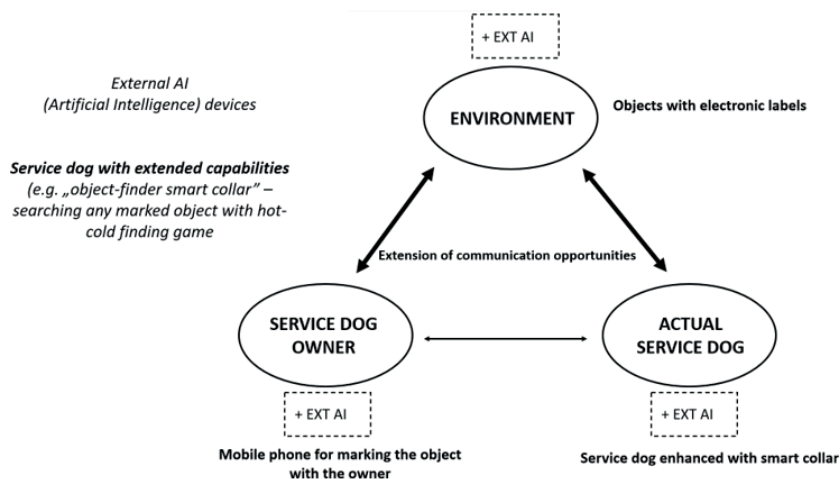


FIGURE 2. SERVICE DOG WITH EXTENDED CAPABILITIES: OPERATING PRINCIPLE OF "OBJECT-FINDING SMART COLLAR" (DESIGNED BY THE AUTHOR)

By implementing this special bidirectional interaction between the service dog and the owner (see Jackson et al., 2013), we enabled the dog to independently perform tasks it previously couldn't manage. The owner can select one of their arbitrarily large number of objects, initiating an interaction between the service dog and the selected object. This is made possible by "upgrading" the dog with a smart collar: a large number of objects become distinguishable through unique labeling, and the dog can be navigated to the selected object using simple acoustic feedback indicating changes in distance. This step, previously unsolvable for the dog due to the numerous object nouns in commands, is now achievable. In the subsequent fetching step, the service dog can easily outperform competitors, such as service robots.

Over the decade since the experiment, new platforms have emerged that surpass contemporary implementations, including ours. However, I believe the baseline remains valid today and can be used in newer applications – possibly re-implemented on more modern devices. Given the special-needs education focus of this study, I will not delve into further technical details; for those, please refer to our previous publications (Loványi, 2014; Loványi, 2022).

Can Service Robots Take Over the Role of Service Dogs?

"After six years of intensive research and \$19 billion spent, Pentagon engineers have shown that the best bomb-detecting robot is a dog" (Nosowitz, 2010).

The latest achievements of our digital age (e.g., internet, automation, robotics, social media, and artificial intelligence) fundamentally change human relationships. We see the phenomenon but cannot fully grasp its aspects. This ambiguity may explain why exaggerated expectations and fears spread quickly, ironically "thanks" to the Internet. Why shouldn't the traditional human-animal relationship system change, including the role of service dogs? The saying "The dog is man's best friend" reflects the long-known healing role of dogs across all three aspects of the "health triangle" (physical, mental, social well-being). However, many wonder if a robot can become the same "good friend", even in the foreseeable future. In Japan, small children consider robot dogs social partners – akin to how "real" dogs are perceived in Western societies (Figure 3).



FIGURE 3. PARO THERAPY ROBOT AMONG JAPANESE CHILDREN VS. KUKU, MY FIRST SERVICE DOG WITH A THERAPY DOG EXAM AMONG HUNGARIAN CHILDREN (PHOTO CREDITS: SHOKO MURAGUCHI, VIRÁG BURÁNYI)

Arguments often arise – usually based on a one-sided comparison of advantages and disadvantages – regarding whether “helping beings” or “helping machines” are better suited for a given task. Videos produced by the NEO Hungarian Non-Profit Service Dog Association (NEO, 2024) clearly illustrate the excellence of service dogs. However, for a “fair” comparison, I consciously use the “competitive” robotics jargon to list the benchmark parameters I consider the most important (Loványi, 2022).

The Service Dog:

- “Mobile robot” of extreme complexity (e.g., “mechanics”, “sensors”, “data processing unit”),
- Real-time operation,
- Intuitive navigation (finds its way around even in an unfamiliar environment),
- Ability to learn/adapt,
- Limited-capacity but non-volatile (hardly ever erased) memory,
- Perfectly functioning sensors (smell, sight, hearing, tactile),
- Better grasping technique than robots, can be trained to perform complex tasks (e.g., carefully pulling out a drawer and then removing the desired object),
- Loves to “serve” its owner (emotional connection on the part of a robot is still barely intelligible today, though social robots are trying to imitate emotions),
- Good properties given by nature can be extended (e.g., with technical upgrades – presented in this study),
- Can be produced relatively cheaply in small series, but must be trained individually afterward.

The Service Robot:

- Has no physical needs,
- Easier to replace; you “just” have to reprogram the new device,
- Can memorize, localize, and manipulate objects,
- Safer in quarantine during an epidemic (no need to take it for a walk),
- Mechanical, impersonal relationship,
- Moves slowly, clumsier,
- Can be hacked,
- Developing a prototype is expensive, but can then be reproduced relatively cheaply in serial production (Loványi, 2020; 2022).

To illustrate this with a specific example related to my case study: my service dog Mák understands several commands. For instance, he flawlessly executes the “Go get the basket!” task on verbal command. Meanwhile, a contemporary service robot presented by Deyle, Reynolds and Kemp (2014) could map the whereabouts of practically an infinite number of objects offline a decade ago, easily “remembering” this map. However, when executing “understood” commands, robots are generally slower and clumsier than Mák. For Mák, tasks like climbing stairs, jumping onto an



armchair, or running on uneven terrain are no problem, surpassing even the home/social robots available today (Loványi, 2022).

Can the “Service Dog or Service Robot” Dilemma be Resolved?

The literature has rarely discussed the solutions provided by service dogs and technical devices with similar functionality together, as authors are typically from distant disciplines with a common target group and problems to address. Therefore, the question of whether a **service dog** or a **service robot** is a more appropriate companion for a person with a disability has often arisen in a one-sided light. The development pace of service robots is much faster nowadays than that of service dogs, as robots are still in their “baby shoes”, while dogs have been learning their service roles for over 10,000 years.

As a special education teacher focusing on applicability, I have found that both approaches have their limitations. Fortunately, these limitations do not coincide. In functions where robots perform poorly, dogs generally excel – and vice versa. Thus, instead of a “competition” of artificially separated disciplines, I recommend an integrated strategy that merges the strengths of both approaches (as we initially did in our case study a decade ago) – a **technology-empowered service dog**.

Social/home robots with traditional appearances (e.g., imitating humans or animals) can also improve the quality of life for disabled people. I consider robots themselves a promising attempt, complementing other proven solutions. Their developers have tried for a long time to make social/home robots capable of receiving/expressing emotions by “humanizing” the embedded technology (Kanda, Sato, Saiwaki & Ishiguro, 2004). Although the IQ of future AI solutions may surpass that of my service dog Mák (how can you reliably compare the IQ of a human, a dog, and a robot?), I find it hard to imagine that they will ever catch up with him in terms of EQ. Mák is smart, but his emotional intelligence is unsurpassable. He lived with my first service dog, Kuku, who gradually handed over his tasks to him. At every moment of their parallel-changing stages of life, the two well-educated and accomplished golden retrievers showed themselves as unique individuals. As mentioned, I don’t believe helper robots will ever possess genuine emotional intelligence, making it inconceivable that they could match Kuku and Mák in this regard.

Motivational theories also favor the service dog. Psychological and biological factors in motivation regulation are closely connected and originate from internal urges and external incentives. As already pointed out with the “health triangle”, a service dog provides excellent support for owners with disabilities on physical, mental-psychological, and social levels (see Figure 1). Maslow’s hierarchy of needs ranges from basic psychological needs to more complex motivations. It is easy to see that a service dog contributes to satisfying several levels of needs simultaneously (e.g., safety, belonging and love, self-esteem, learning, and self-realization) (Maslow, 1954).

On the other hand, watching a YouTube video promoting a recent development (New Super Intelligent Robot Dog, 2022), it was striking that everyone was more



scared than relieved by the “cute” robot dog. I thought the basic functions of a guide dog might be replaced by such structures. Finally, I concluded that the latest technology and a flesh-and-blood guide dog should work together to ensure the well-being of their blind owner (see Figure 1). Since the assistance dog naturally has four legs, duplicating them with expensive mechanics may be unnecessary. Why can't some useful AI functions extend the guide dog's capabilities in the simplified form of a smart collar or mobile app? By repurposing the general approach of our object detection smart collar from a decade ago for other service dog tasks, we could implement this on the latest platforms.

Positive Lessons from Inclusive Research with a Multidisciplinary Approach

The development of service dogs with “extended capabilities” has promoted more effective inclusion of people with disabilities (Loványi, 2022). However, the development has provided more general lessons:

- Synergies previously hidden from representatives of individual disciplines were released within the framework of multidisciplinary inclusive (participative/emancipatory) joint research. Therefore, the effectiveness of research conducted this way justifies the more frequent use of this methodology, alongside moral or legal constraints (equal opportunities law).
- Whoever first formulated the idea that “a well-asked question gives away half of the knowledge (solution)” is lost in the past. Concise formulations of basic truths usually do not have a single identifiable author. Hence, I do not arbitrarily mark any source or quote any version of the saying. Adapting this to the current lessons, I will ask: during projects aimed at increasing the well-being of individuals with disabilities, who else could ask “better” questions than the relevant professionals participating in it? Of course, one must be able to give good answers to good questions in every detail of implementation. The “other half” of knowledge/solutions must still be provided by eminent representatives of other disciplines.

Participative/emancipatory multidisciplinary projects ensuring the inclusion of affected people provide the best framework for supporting the well-being of one or more special-needs social circles (people with disabilities are the focus of my study). Effective cooperation requires an accepting attitude and a barrier-free working environment. Last but not least, service dog owners should be active and open, as much depends on them, not only on the non-disabled research group members (Loványi, 2020).

Not only in education but also in the creation and development of new support services, the inclusive approach that supports the cooperation of disabled and non-disabled partners is gaining ground. This approach enables disadvantaged groups (e.g., people with various disabilities or the elderly) to have a voice in research topics about them/for them (Loványi, 2020). People with disabilities are the best experts on their own well-being. Participatory and emancipatory research is an obvious form



of inclusion in an accessible society, which I have experienced several times in the past decade. The participation of people with disabilities is crucial in implementing “high-tech” developments, as they can make use of their professional and personal experiences, present their real opinions, and provide innovative ideas based on their life situation. There is also an opportunity to form a positive attitude: if disabled professionals carry out scientific work, their recognition may increase in the eyes of the majority society, and it may also motivate other service dog owners if the research leader/project member is their partner. This way, disabled individuals can benefit even more from the developments, without having to adapt to external specialists whose focus may be more on academic careers than equal opportunities (Wickenden & Lopez Franco, 2021; Loványi, 2022).

Conclusion

The technology-empowered cooperation between service dogs and their handlers has opened previously uncharted horizons for ensuring the well-being of people with disabilities at home. While the names of objects typically hold little meaning for dogs, it's crucial for their owners with disabilities that the dogs can bring specific items like a shoe or a key upon request. A “smart collar” is effective for this, similar to the simple “hot-cold” children's game, signaling the service dog with an increasingly intense beep as it approaches the labeled object designated by the owner (Loványi, 2014).

We can enhance the efficiency of not only mobility dogs but also other types of service dogs with task-specific “smart collars”. For instance, the assistance of diabetic alert dogs or dogs aiding elderly people can be life-saving if their owner falls ill. In an emergency, it is vital that a service dog can quickly and reliably retrieve the requested item (e.g., a medicine box).

Numerous companies have launched products also called “smart collars”. However, these primarily make the owner more “capable” of a task, such as easily locating their dog even in the dark or in the forest. The application scenario we developed allows us to avoid demanding impossible tasks from specially trained four-legged companions, as subtasks that service dogs cannot complete effectively can be supplemented with new “added” technology. Until now, service dog training has rarely utilized the additional opportunities provided by the latest technologies, which can improve the dog-human relationship by allowing them to mutually “understand” each other's needs (Rybarczyk et al., 2013).

The idea of possible “joint action” between service dogs and social robots has also been proposed, but realization is still pending (Abdai & Miklósi, 2018). However, we can already achieve synergy by skillfully combining selected technical sub-solutions into a portable device suitable for a task that can be understood by a service dog (e.g., the “object finder smart collar”), integrating some system elements. In all smart homes where keeping a dog is possible and desirable, the combined application of service dogs and existing technology can create synergies that have not been researched so far. In our case study, the service dog remained the “main character”, with (robot) technology supplementing the animal's knowledge/skills. However, I do not rule out that this role could be reversed in long-term animal-machine collaborations, or that both could become protagonists (Loványi, 2022).



The participatory project confirmed the importance of the active role of experienced experts with disabilities. Integrating good practices from special pedagogy/technical fields and service dog training, combined with the critical thinking of representatives from various scientific disciplines, resulted in effective, innovative solutions. The active contribution of owners with disabilities was essential, bringing unique insights and ideas. Effective cooperation required an accepting attitude and a barrier-free workplace.

The starting point of my study was the Health Triangle concept, derived from the constantly evolving definition of the World Health Organization (WHO) (see Figure 1), making the extended “well-being” interpretation of “health” widely accepted (Loványi, 2020; 2022). By examining the small black triangle logo on Figure 1, new mappings of the special-needs education questions that concern me appear, providing future specific projections of the complex concept of human “well-being”. From this, another set of relevant benchmark characteristics of “well-being” may be outlined, leading to the conceptual expansion and renewal of keywords already interpreted in the study (e.g., equal opportunities, barrier-free access). This “structured” thinking process highlights the possible goals of my further research. For example, after demonstrating the positive impact of service dogs on the well-being of disabled and elderly people, the investigation can be extended to other interconnected aspects of digital, economic, political, and environmental well-being. Refining surveys and improving the accuracy of action plans derived from them can include characteristics related to age, gender, country, religion, and other individual factors. The test model is considered robust enough when it can provide individual well-being for the affected group with acceptable accuracy, while the overall assessment and evaluation according to the developed metrics remain manageable.

My service dogs’ well-being has always been just as important to me as my own. We designed the case study discussed in this article to ensure Kuku participated willingly and motivatedly. As a closing remark, I would like to declare that the future (excessive) “enhancement” of service dogs with technology should never come at the expense of their quality of life as animals (Hauskeller, 2017).

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<https://www.flickr.com/photos/7669837@N08/2117643398> (2024.04.28.)

Figure 3/2.: Virág Burányi, NEO Magyar Segítőkutya Közhasznú Egyesület

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